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HEALTH OF THE SCHOOLCHILD

BY

VERA NORRIS

Department of Medical Statistics, University of Birmingham

Though it has long been customary for schools, whether supported by private or by public funds, to maintain attendance and medical records, little use has been made of them to evaluate the causation of absenteeism in schoolchildren. This communication is the result of an *ad hoc* survey of the medical and absence records kept in a girls' grammar school, which was originally undertaken to ascertain the effects of long-distance travelling on the health and educational progress of the schoolchild. Analysis of the data disclosed unforeseen variables, the effect of which makes it impossible to draw decisive conclusions upon that subject, but it may not be unprofitable to examine how far they can provide answers to the following questions:

(*i*) What information is obtainable from school records as they are maintained at present ?
(*ii*) What is the use of information so obtained ?
(*iii*) What improvements in the design of school records would yield more adequate and accurate information regarding the health of adolescents ?

The school concerned, housed in modern buildings in a pleasant residential area, has a high reputation both academically and socially. Entrance places, for which there is keen competition, are awarded on the results of various examinations. The absence experience may not be typical of all schools providing further education for children over the age of fifteen.

Available Records

The following records, kept as a routine, were available:

(1) Ministry of Education registers;
(2) Registers recording reasons for absence;
(3) Medical record cards.

(1) The Ministry of Education registers provided information for each pupil regarding the frequency of absence and the duration of each absence.

(2) Information regarding causation was available for 2 years (1946-47, 1947-48). As a general rule the school authorities did not require certification of short-term illnesses, i.e. less than 3 days, by medical practitioners except in unusual circumstances, and in many cases notes from the parents were accepted. Consequently, it was only justifiable to classify the causes of absence under these broad headings:

(*a*) acute diseases of the respiratory system, including the miscellaneous respiratory syndromes variously described as cold in the head, influenza, cough, chill, etc.
(*b*) other medical ailments including specific infectious diseases, rheumatism, sickness, dysmenorrhoea, etc.
(*c*) miscellaneous causes other than illness, e.g. transport difficulties, external examinations for scholarships, social and family reasons, etc.
(*d*) unspecified and unrecorded causes.

(3) The medical records provided information respecting:
(*a*) medical history,
(*b*) height and weight,
(*c*) visual defects,
(*d*) contemporary physical condition,
(*e*) menarche.

Each girl on entry to the school at approximately 11 years of age was examined by the school doctor and at this examination the medical record was initiated. After 4 or 5 years a further medical examination was made. Girls whose physical condition was not considered satisfactory by either the parents or the teachers had supplementary examinations during the intervening period.

Average heights and weights in the various age groups have been calculated from every available observation, so that two observations of height and weight have been recorded for every girl (200 in all) who, at the time of the survey, had had two medical examinations. Unless a girl was menstruating at the time of her first examination no record of age of onset was made until the second examination.

In noting records of previous illness, infectious diseases of childhood were ignored unless some complication (e.g. broncho-pneumonia) had arisen as a result, for it was felt that in many cases the parents would not recall mild attacks of infectious disease in early childhood.

Absence Rates

To describe absence rates the following definitions will be necessary:

Occasion of Absence	A series of consecutive days during which the pupil was absent from school.
Duration of Absence	The number of consecutive days absent including week-ends when an occasion of absence began in one week and continued to the next.
Absentee	A pupil who began an absence during a specified period (e.g. term or week).
Short-term Absence	An absence of less than three days.

The summer terms were disregarded because so many absences were due to holidays with parents, examinations, and other activities sanctioned by the school.

Information was available regarding the cause of absence among 369 girls for five terms, Spring and Autumn 1946, Spring and Autumn 1947, and Spring 1948.

Tables I - III show the following absence rates for each of the five terms:

I. Average number of absences for each pupil.
II. Average number of days of disability for each pupil.
III. Average duration of each occasion of absence.

Respiratory Disease as a Major Cause of Disability

These Tables show that respiratory disease was ostensibly the most frequent cause of absence, that it caused the greatest number of days of disability, and (with the exception of two terms when there were epidemics of measles and scarlet

TABLE I

AVERAGE NUMBER OF OCCASIONS OF ABSENCE FOR EACH PUPIL

Cause of Absence	Term				
	Spring 1946	Autumn 1946	Spring 1947	Autumn 1947	Spring 1948
Respiratory Disease	0·707	0·463	0·783	0·601	0·351
Unspecified	0·293	0·233	0·481	0·458	0·305
Other Medical	0·233	0·295	0·387	0·243	0·298
Non-medical	0·043	0·249	0·157	0·392	0·122
Total	1·276	1·241	1·807	1·694	1·077

TABLE II

AVERAGE NUMBER OF DAYS OF DISABILITY FOR EACH PUPIL

Cause of Absence	Term				
	Spring 1946	Autumn 1946	Spring 1947	Autumn 1947	Spring 1948
Respiratory Disease	3·157	1·274	3·063	1·812	1·274
Unspecified	0·919	0·358	1·022	0·871	0·888
Other Medical	0·908	0·593	2·269	0·552	1·34
Non-medical	0·122	0·547	0·299	0·951	0·27
Total	5·106	2·772	6·653	4·187	3·772

TABLE III

AVERAGE NUMBER OF DAYS OF DISABILITY FOR EACH OCCASION OF ABSENCE

Cause of Absence	Term				
	Spring 1946	Autumn 1946	Spring 1947	Autumn 1947	Spring 1948
Respiratory Disease	4·46	2·75	3·91	3·02	3·63
Unspecified	4·13	1·53	2·13	1·9	2·91
Other Medical	3·9	2·01	5·86	2·27	4·49
Non-medical	2·81	2·2	1·91	2·42	2·2
Total	4·0	2·23	3·68	2·47	3·5

fever) that the average duration of absence caused by respiratory disease was longer than for any other cause. During the five terms there were 2,379 occasions of absence, of which 990 (42 per cent.) were due to respiratory disease. The total number of days of disability during this period was 7,610, of which 3,432 (45 per cent.) were due to respiratory disease.

Table IV shows the frequency of absences of varying length. Comparison of the frequency with which respiratory disease causes short-term absences with the frequency of such absences due to all other causes shows that respiratory disease produces a significantly smaller proportion of short-term absences (Table V). A similar result is obtained if absences due to respiratory disease are compared with absences due to other medical causes.

TABLE IV

DISTRIBUTION OF ABSENCES BY DURATION AND CAUSE
(total of five terms)

Length of Absence (days)	Cause of Absence							
	Respiratory Disease		Other Medical		Non-medical		Unspecified	
	No.	%	No.	%	No.	%	No.	%
1	320	32·3	287	58·6	149	47·8	347	59·3
2	200	20·2	78	15·9	92	29·5	103	17·6
3	146	14·7	17	3·5	28	8·9	42	7·2
4	83	8·4	9	1·8	9	2·9	27	4·6
5	88	8·9	13	2·7	13	4·1	25	4·3
6	21	2·1	5	1·0	3	1·0	8	1·4
7	20	2·0	6	1·2	4	1·3	4	0·7
8 and over	112	11·4	76	15·5	15	4·8	29	4·9
Total	990	100·0	491	100·0	313	100·0	585	100·0

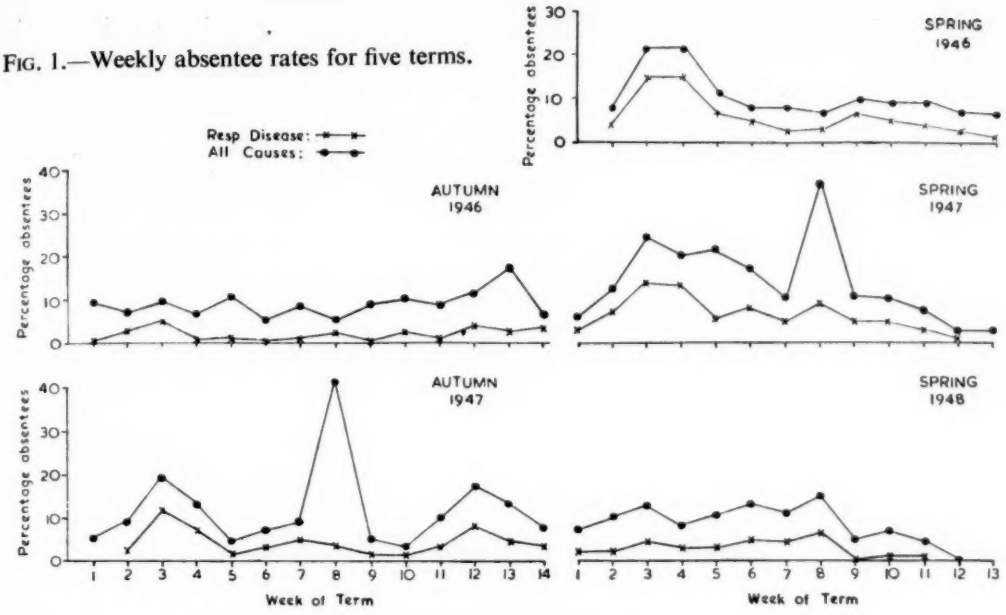
TABLE V

FREQUENCY OF SHORT-TERM ABSENCE

Cause of Absence	Total No. Absences	Per cent. Short-term Absences	Difference	Standard Deviation %	*P*
Respiratory Disease ..	990	52	24	2·0	0·0001
All Other	1,389	76			
Respiratory Disease ..	990	52	22	2·7	0·0001
Other Medical	491	74			

Seemingly, therefore, respiratory disease is a major cause of absenteeism, not only by virtue of its frequency but also because it is the most predominant cause of long-term absences unlikely to be due to malingering or truancy. Absentee rates, calculated for each week in the five terms to disclose terminal variations in absence, are shown graphically in Fig. 1. The peak rate in the 8th week of the Spring term, 1947, was due to exceptionally hard weather conditions and a grave fuel shortage. The peak in the 8th week of the Autumn term, 1947, was due to a transport strike. Except in such unusual circumstances the absentee rates for all causes closely follow the pattern of those due to respiratory disease.

FIG. 1.—Weekly absentee rates for five terms.



EFFECT OF MEDICAL DISABILITIES ON ABSENCE

In the medical records of 297 girls, 73 (24 per cent.) gave a history of some medical disability other than visual or postural defects (Table VI); 34 per cent. suffered from visual defects which were recorded at one or both of the medical examinations.

TABLE VI

DISABILITIES RECORDED IN MEDICAL HISTORIES OF GIRLS PRESENT IN THE SCHOOL, 1945/46

Disability	No. of Girls	Percentage
Pneumonia (all types)	16	21·9
Otitis Media and/or Mastoiditis	13	17·8
Dysmenorrhoea	7	9·5
Cardiac Lesions	5	6·9
Rheumatism	5	6·9
Nephritis	5	6·9
Chronic Bronchitis	3	4·1
Chronic Tonsillitis	3	4·1
Appendicitis and/or Appendectomy	3	4·1
Allergy	2	2·6
Rheumatism and Cardiac Lesions	2	2·6
Rheumatism and Otitis Media	1	1·4
Diabetes	1	1·4
Congenital Dislocation of Hip	1	1·4
Dysentery (tropical)	1	1·4
Extensive Dental Caries	1	1·4
Tubercular Neck Glands	1	1·4
Congenital Deafness	1	1·4
Nephrostomy	1	1·4
Sinusitis	1	1·4
Total	73	100·0

To determine the effect of a medical disability on absence, the average number of occasions of absence per pupil, excluding absences for non-medical reasons, was calculated for girls of two groups.

Group 1. With *no* record of medical disability.
Group 2. With a record of medical disability.

The results (Table VII) show that Group 2 had a higher absence rate in each term, although in Spring, 1948, the difference between the groups was very small.

TABLE VII

AVERAGE NUMBER OF OCCASIONS OF ABSENCES PER PUPIL

Group	Term				
	Spring 1946	Autumn 1946	Spring 1947	Autumn 1947	Spring 1948
1	1·19	0·95	1·49	1·2	0·95
2	1·47	1·17	2·31	1·74	0·96
Total	1·23	0·99	1·65	1·3	0·95

PHYSICAL DEVELOPMENT AND ITS EFFECT ON MENARCHE

Table VIII, citing the average weights and heights at approximate ages, shows a spurt of growth in both mean heights and weights between the ages of 12·5 and 13·5 years. Since the mean age of menarche is 13·5 years, this spurt corresponds to the premenstrual period, and is in accordance with earlier work on the relationship of puberty to body build (Hogben and others, 1948).

To compare the physique of children of different ages, Tuxford (1942) described an index which takes into account height, weight, and chronological age. The value of the index for normal (i.e. average) physique at any age is 1·00; values below 1·00 indicate less than, and values above 1·00 more than, average physical development. The formula for girls is $(W \times 308 - m) \div H \times 235$, where W is the weight in lb., H the height in inches, and m the age in months. In the present communication a nomogram prepared from this formula by Campbell and Weir (1948) has been used to estimate the index; the limits of the nomogram were 0·8 and 1·2.

There were no girls with a Tuxford index (T.I.) of less than 0·8, and there were 18·2 per cent. with an index of more than 1·2. For convenience the Tuxford indices have been grouped as follows:

(A) 0·80–0·979—less than normal
(B) 0·98–1·119—normal
(C) 1·12 and over—more than normal

Of 271 girls the percentage in each group was:

A, 29·5
B, 41·5
C, 29·0

Table VIII also shows the Tuxford indices for the average weights and heights at various age groups. The values for each age group from 10·5 to 14·5 inclusive are reasonably consistent; the mean value for the four observations is 1·05. Thereafter the Tuxford

TABLE VIII
AVERAGE HEIGHTS, WEIGHTS, AND TUXFORD INDICES

Approx. Age (years)	No. of Observations	Average		T.I. of Average Weights and Heights
		Weight (lb.)	Height (in.)	
10·5	40	76	55·5	1·06
11·5	192	83	57·3	1·05
12·5	34	89	58·8	1·02
13·5	14	103	60·9	1·05
14·5	9	117	61·6	1·08
15·5	133	125	64·1	1·01
16·5	61	126	64·0	0·92

index drops; but, as it is not intended for use in the older age groups when growth slows down, no undue significance should be attached to this downward trend.

The age of menarche was recorded at the second medical examination except in the few instances when a girl was already menstruating at the time of the first. Information regarding the age of inception was obtained in respect of 174 girls, the mean being 13·5 years. Approximately 10 per cent. of the girls were menstruating before 12·5 years and 8 per cent. did not begin until after 14·5 years. In Tuxford Group A, the mean age of menarche was 14·1, in Group B, 13·8, and in Group C, 12·7 years. The proportions of girls beginning menstruation by 13·5 years vary considerably in the three groups (Group A, 42 per cent.; Group B, 58 per cent.; Group C, 89 per cent.). The difference of 47 per cent. between Groups A and C has a standard deviation of approximately 10 per cent., and the odds against so large a difference occurring by chance are over 16,000 to 1. It is therefore safe to say that there is some relationship between body build and sexual development. These results are shown in Table IX.

TABLE IX
PERCENTAGE DISTRIBUTION OF AGES OF MENARCHE AMONG TUXFORD INDEX GROUPS

Tuxford Index Group	No. of Girls	Mean Age of Menarche	Age of Menarche (years)						All Ages
			10·5	11·5	12·5	13·5	14·5	15·5	
A 0·8 –0·979 ..	33	14·1	—	3·0	6·1	33·3	45·5	12·1	100
B 0·98–1·119 ..	86	13·8	—	1·0	23·3	33·7	31·5	10·5	100
C 1·12 and over ..	55	12·7	5·4	22·0	32·7	29·0	0·1	1·8	100
Total	174	13·5	1·7	8·0	23·3	32·0	27·0	8·0	100

PROBLEM OF RECURRENT ABSENTEEISM

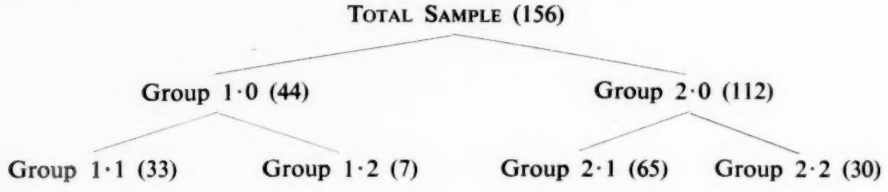
It has been demonstrated by Greenwood and Woods (1919) and by Newbold (1926) that certain individuals are *accident-prone*. From an analysis of the incidence of colds among college students, Gafafer and Doull (1933) concluded that:

(*a*) colds are distributed by chance;
(*b*) in consecutive years there is a tendency for persons to remain in the same "cold-number" class;
(*c*) for observations separated by as long an interval as 2 years, no such constancy is detectable.

A revaluation of Gafafer's data by Wilson and Worcester (1944), who employed a different statistical technique, led to the conclusion that the distribution of colds was not due to chance but was affected by an inter-individual variation of resistance to common cold or by some systemic influence, such as a higher exposure rate, which stimulated it among some of the persons under observation.

Analysis of the records under discussion led to the impression that certain individuals are more prone to absence than others. The records of 156 girls who were members of the school during the five school years, 1943/44 to 1947/48, were therefore re-examined.

Various sub-groups of this sample are considered below, and the following schema has been devised to clarify the position at the outset. (Number of girls in each group shown in brackets.)



These groups may be defined as follows:

1·0	*No* absences at all during the Autumn term, 1943.
2·0	*At least one* absence during the Autumn term, 1943.
1·1, 2·1	No history of medical disability as defined above.
1·2, 2·2	With a history of medical disability.

The division of the sample in Groups 1·0 and 2·0 was made on the purely arbitrary criterion of absence in the Autumn term, 1943, hereafter called the *standard* term. If the absence experience in one term is independent of that in another, we should not expect to find any significant difference with respect to absence between the groups in terms subsequent to the standard. However, if some individuals are absence-prone we might reasonably infer that they are more likely than not to be found in Group 2·0. It is legitimate to make such an inference only in so far as we can satisfy ourselves that our groups are alike in all respects other than absence in the selected standard term. Accordingly it is essential to compare each with its fellow with respect to the following factors, designated " criteria of homogeneity ", which may have an effect on absenteeism:

(1) History of medical disability.
(2) Social class.
(3) Physique.
(4) Chronological age.
(5) Sexual age.

If no significant differences are found between Groups 1·0 and 2·0, it is justifiable to assume that, as far as is ascertainable from the available information, they are homogeneous in physical and social environments.

CRITERIA OF HOMOGENEITY

(1) *History of Medical Disability.*—The proportion of girls in Group 1·2 was 17·5 per cent. of the total in Group 1·0, and in Group 2, 31·6 per cent. The standard deviation (S.D.) of the difference is 8·4 per cent. and the probability of such a difference occurring by chance is high ($0{\cdot}09 > P > 0{\cdot}08$). However, as was shown

earlier, medical disability has a marked effect on absence, so that comparisons will be made below between Groups 1·1 and 2·1, and Groups 1·2 and 2·2, whenever possible.

(2) *Social Class.*—The school population was divided into the five social classes described by the Registrar-General according to the occupation of the father. The proportion of girls in social classes I and II (i.e. professional, business executives, school teachers, senior clerical grades in Civil Service, or local government) in the two groups 1·0 and 2·0 were compared. In the former 57 per cent. and in the latter 61 per cent. came from the social classes I and II. The standard deviation of the difference is 9 per cent.; the difference, 4 per cent., is almost certainly due to chance ($P \simeq 0 \cdot 74$).

(3) *Physique.*—The Tuxford index was used to measure physique. Excluding girls with a Tuxford index greater than 1·2, the mean index was 1·009 for Group 1·0, and 1·035 for Group 2·0. The difference, 0·24, is not significant (S.D. = 0·186, $P = 0 \cdot 85$). The proportion of girls with indices higher than 1·2 in Group 1·0 was not significantly different from that in Group 2·0. In the former it was 21 per cent., and in the latter, 19 per cent. (difference 2 per cent., S.D. = 8 per cent., $P = 0 \cdot 80$). The distribution of the girls in the two sections 1·0 and 2·0 among the three Tuxford index groups defined earlier is shown in Table X.

TABLE X

EFFECT OF PHYSIQUE ON ABSENCE PRONENESS

Tuxford Index Group	Group			
	1		2	
	No.	%	No.	%
0·8 –0·979	13	29·5	18	16·1
0·98–1·119	14	31·8	40	35·7
1·12 and over	12	27·3	32	28·6
Unspecified	5	11·4	22	19·6
Total	44	100·0	112	100·0

$\chi^2 = 4 \cdot 465$. d.f. = 3. $0 \cdot 3 > P > 0 \cdot 2$.

(4) *Chronological Age.*—The mean age of girls in Group 1·0 is 12·03 years, and of those in Group 2·0 it is 11·83 years. The standard deviation of the difference is 0·305 years, and the probability of the difference (0·02 years) being due to chance 0·5.

(5) *Sexual Age.*—The mean age of menarche was 13·58 years in Group 1·0 and 13·62 years in Group 2·0. The difference (0·04) is not significant (S.D. = 0·21 years). The distribution of the girls in the two groups among the various ages of menarche is shown in Table XI (overleaf).

If the above are accepted as tests of homogeneity, it can be said that Groups 1·0 and 2·0 are alike in these respects. If there is then any marked difference in absence experience between these two sections, these criteria may be eliminated as possible factors in its causation. The possible exception is the difference, albeit statistically insignificant, in the proportions of girls with medical disabilities in the two groups. Where possible, Sub-groups 1·1 and 2·1 will be examined separately.

TABLE XI

EFFECT OF AGE OF MENARCHE ON ABSENCE PRONENESS

Age at Menarche (years)	Group			
	1		2	
	No.	%	No.	%
10·5	—	6·9	2	1·8
11·5	3	6·9	6	5·4
12·5	10	22·7	16	14·3
13·5	14	31·8	29	25·9
14·5	10	22·7	20	17·9
15·5	1	2·3	8	7·1
Unspecified	6	13·6	31	27·6
Total ..	44	100·0	112	100·0

The classes with small numbers are grouped together as bracketed.
$\chi^2 = 3 \cdot 907$. d.f. = 3. $0 \cdot 3 > P > 0 \cdot 2$.

The absence experience of Groups 1·0 and 2·0 was compared by recourse to the following yardsticks:

(1) The mean number of absences per term per pupil.

(2) The distribution of girls among various absence-classes.

(Girls who have *no* absences in a specified term are included in the 0-absence class, those with *one* absence in the 1-absence class, etc.)

(3) The distribution of the number of terms completely free from absence after the standard term.

(4) The correlation of the number of absences experienced in one term with that in another.

ABSENCES PER PUPIL.—The mean number of occasions of absence per pupil in each term are shown in Table XII and Fig. 2. The means are shown for each of the Groups 1·0 and 2·0, and for each of the Sub-groups 1·1, 2·1, 1·2, 2·2. In every instance except one the mean number of absences in Group 2·0 and its sub-groups

TABLE XII

MEAN NUMBER OF OCCASIONS OF ABSENCE

Group	No. of Pupils	Term			
		1944	1945	1946	1947
1·0	44	0·568	0·659	0·818	1·114
2·0	110	1·3	1·444	1·241	1·509
1·1	33	0·567	0·515	0·808	0·909
2·1	65	1·19	0·908	1·108	1·27
1·2	7	0·857	1·143	1·0	2·285
2·2	30	1·7	1·896	1·667	1·953

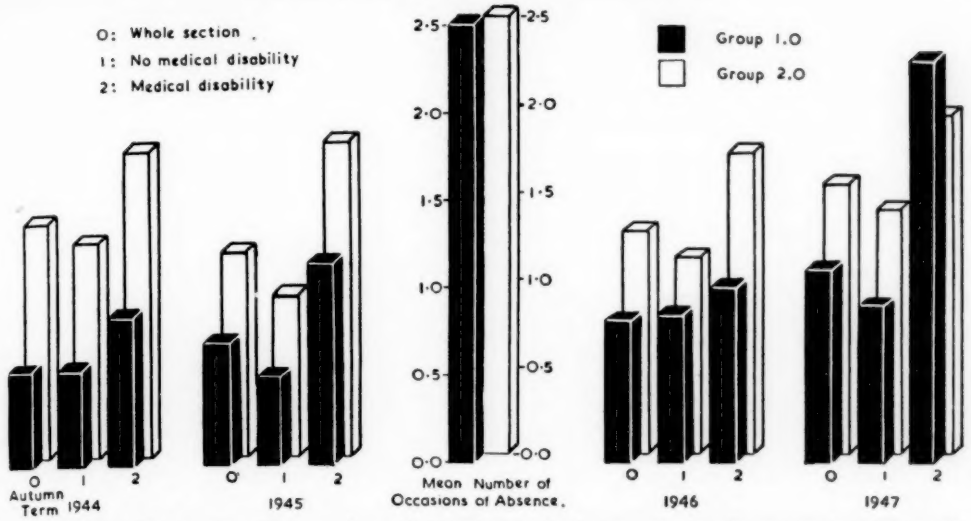


FIG. 2.—Comparison of mean number of occasions of absence from all causes in Groups 1·0 and 2·0.

is greater than that in Group 1·0 and its sub-groups. In view of the small numbers in Group 1·0, and particularly in its Sub-group 1·2, this constancy is remarkable.

EFFECT OF DISABILITY.—Each group was investigated in the four Autumn terms following Autumn, 1943, to determine the frequency with which girls of either group came into the various absence-classes. The problem can be stated thus:

> What proportion of girls in Group 1·0 had no absences at all in the Autumn term, 1944, or 1945, etc., and was this proportion significantly different from that in Group 2·0 ?

If we assume that the members of either group are equally liable to absence then we should not expect to find a significant difference between the groups with respect to the distribution in the various absence classes. Fig. 3 and Table XIII (overleaf) show that the frequency distributions of the various absence-classes in Groups 1·0 and 2·0 are significantly different.

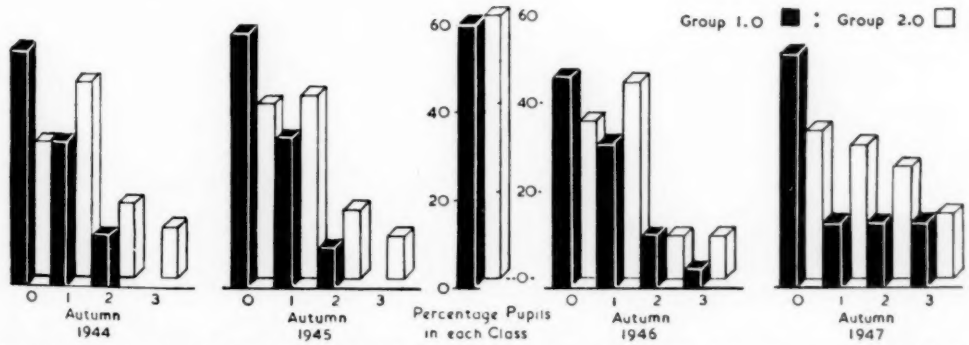


FIG. 3.—Percentage distribution of girls in the absence classes (0-3) in Groups 1·0 and 2·0.

TABLE XIII

PERCENTAGE DISTRIBUTION OF GIRLS AMONG THE VARIOUS ABSENCE CLASSES
Comparing Group 1·0 with 2·0, and Group 1·1 with 2·1

Autumn Term	Group	Percentage Frequency of each Absence Class							Remarks
		0	1	2	3	4	5	6	
1944	1·0	59·1	29·5	9·1	—	2·3	—	—	$\chi^2=18·97$
	2·0	23·6	41·8	19·1	11·8	3·6	—	—	$0·001>P$
	1·1	54·5	33·3	12·1	—	—	—	—	$\chi^2=6·949$
	2·1	28·6	42·9	14·3	9·5	4·8	—	—	$0·05>P>0·02$
1945	1·0	50·0	38·6	9·1	—	2·3	—	—	$\chi^2=6·732$
	2·0	36·9	34·3	12·6	11·7	2·7	1·8	—	$0·05>P>0·02$
	1·1	57·6	33·3	9·1	—	—	—	—	$\chi^2=4·467$
	2·1	38·4	40·0	13·8	7·7	—	—	—	$0·2>P>0·1$
1946	1·0	52·3	29·5	9·1	6·8	—	—	2·3	$\chi^2=5·642$
	2·0	33·0	33·9	16·1	12·5	1·8	2·7	—	$0·1>P>0·05$
	1·1	48·5	33·3	12·1	3·0	—	—	3·0	$\chi^2=1·977$
	2·1	33·8	43·1	9·2	9·2	1·5	3·1	—	$0·7>P>0·5$
1947	1·0	47·4	15·9	15·9	18·2	2·3	—	—	$\chi^2=8·663$
	2·0	24·5	29·1	24·5	17·3	2·7	0·9	0·9	$0·05>P>0·02$
	1·1	54·5	15·2	15·2	15·2	—	—	—	$\chi^2=5·017$
	2·1	31·7	28·6	23·8	12·7	3·2	—	—	$0·1>P>0·05$

When the Sub-groups 1·1 and 2·1 are considered (i.e. the girls with no history of medical disability) the distributions in the last three terms are not significantly different. This result is probably due in part to the small numbers in the higher absence groups. If we consider the proportions for the four terms in the 0-absence class only, we get the results set out in Table XIV. The proportionate differences in the 0-absence class are significant for all groups in all terms except Autumn, 1945, and Autumn, 1946.

TABLE XIV

PERCENTAGE OF GIRLS WITH PERFECT ATTENDANCE IN VARIOUS TERMS
(Comparing Groups 1·0 and 2·0, and Groups 1·1 and 2·1)

Autumn Term	Percentage in 0-Absence Class		S.D.	*P*
	Group 1·0	*Group* 2·0		
1944	59·1	23·6	8·4	$0·0001>P>0·00001$
1945	50·0	36·9	13·0	$0·14>P>0·13$
1946	52·3	33·0	19·3	$0·01>P>0·02$
1947	47·7	24·5	23·2	$0·001>P>0·01$
	Group 1·1	*Group* 2·1		
1944	54·5	28·6	10·3	$0·02>P>0·01$
1945	57·6	38·4	10·6	$0·1>P>0·05$
1946	48·5	33·8	10·4	$P\simeq 0·18$
1947	54·5	31·7	10·5	$0·04>P>0·03$

Each girl of the sample remained at school for a further five Spring and four Autumn terms. The total number of terms after the standard term experienced by girls in Group 1·0 was 396 (=9×44), and 1,008 (=9×112) for Group 2·0. If no girl in either section had any absence during the whole nine terms, there would be 396 terms of perfect attendance in Group 1·0, and 1,008 in Group 2·0. Table XV shows the frequency with which girls in the various groups experienced 0, 1, . . 9 terms of perfect attendance, and that there are significant differences between the frequency distribution of the two groups. We can also determine the proportion of terms in which there was perfect attendance for the two groups (Table XVI).

TABLE XV

FREQUENCY DISTRIBUTION SHOWING NUMBER OF GIRLS WITH x TERMS OF PERFECT ATTENDANCE (WHERE x LIES WITHIN THE LIMITS 0–9)

Group	No. of Girls	Number of Terms (x)										Remarks
		0	1	2	3	4	5	6	7	8	9	
1·0	44	2	5	7	5	8	6	2	6	2	1	$\chi^2 = 13{\cdot}7$ d.f. = 5
2·0	112	22	18	26	11	11	15	6	3	—	—	$0{\cdot}02 > P > 0{\cdot}01$
1·1	36	1	5	6	3	6	5	2	6	2	—	$\chi^2 = 7{\cdot}46$ d.f. = 5
2·1	65	9	10	14	9	7	10	4	2	—	—	$P = 0{\cdot}05$

Note.—To use the χ-squared test in this instance it was necessary to group together $x=0$ and 1; and $x=6$, 7, 8, and 9.

TABLE XVI

COMPARISON OF VARIOUS GROUPS AS REGARDS PERCENTAGE OF TERMS OF PERFECT ATTENDANCE

Group	Number of Terms:			Difference per cent.	Standard Deviation per cent.	P
	Experienced	With Perfect Attendance				
		Number	Per cent.			
1·0	396	175	44	16	2·7	·07[1]
2·0	1,008	279	28			
1·1	324	145	45	14	2·0	·08[1]
2·1	585	179	31			

There can be little doubt about the significance of the difference between the groups in this respect; but the absence experiences of the two groups separately and together can also be investigated by determining the correlation between the number of absences incurred by each girl in Spring, 1944, and the number she incurred during subsequent Spring terms. If the absence experience in one term were independent of that in another, correlation between the two sets of paired observations would not exist and the correlation ratio would be zero, or would not differ significantly from it. In Group 1·0 the only term in which the absence

experience was significantly correlated with that of Spring term, 1944, was the Spring term, 1947, during which term there were epidemics of German measles, measles, and scarlet fever. In Group 2·0 significant correlation ratios were obtained for three terms. When the two groups are merged together the absence in every term is significantly correlated with that in Spring, 1944. These results are shown in Table XVII.

TABLE XVII

CORRELATION RATIOS FOR THE NUMBER OF ABSENCES IN VARIOUS TERMS WITH THAT IN STANDARD TERM, SPRING 1944

Group	No. of Girls	Spring Term			
		1945	1946	1947	1948
1·0	44	0·041 $P>0·9$	0·203 $0·2>P>0·1$	0·383 $0·01>P$	0·242 $0·1>P>0·05$
2·0	112	0·314 $0·001>P$	0·150 $0·2>P>0·1$	0·212 $P=0·02$	0·188 $0·05>P>0·02$
Both	156	0·213 $0·001>P$	0·172 $0·02>P>0·01$	0·27 $0·01>P$	0·211 $0·001>P$

The effects of social class and the number of siblings in the pupils' families were assessed by correlation. The social classes were each given a numerical value in accordance with their designation (e.g. Social Class I = 1, etc.). The mean number of absences per pupil per term was determined using the data of ten terms. The number of siblings in each family was likewise correlated with the mean number of absences (Table XVIII). In neither instance is the correlation ratio significantly different from zero.

TABLE XVIII

EFFECT ON ABSENCE OF SOCIAL CLASS AND SIZE OF FAMILY

Criterion	All *without* a Medical Disability		All *with* a Medical Disability	
	Correlation	*P*	Correlation	*P*
Social Class	0·034	0·1	0·25	$0·1>P>0·05$
No. of Siblings ..	0·069	0·1	0·017	$P\simeq 0·1$

DISCUSSION OF ABSENCE PRONENESS.—Both the methods employed above give rise to the following conclusions:

(*i*) Individuals are not alike in their proneness to absence.
(*ii*) Notwithstanding the small samples examined, it is reasonable to assume that this proneness lasts in some cases at least as long as 5 years.

(*iii*) Although there is a *prima facie* case for considering medical disability to be a major factor in the absence proneness, further study indicates that it is not the only cause of recurrent absence and that in this survey absence proneness could not be attributed to any single cause.

It has been shown earlier that 42 per cent. of the total absences were specified as due to respiratory disease. In addition, no cause was specified for about 25 per cent. of all absences, and it is likely that a high proportion of these unspecified absences were also due to respiratory disease. It might well be that this absence proneness is due to the fact that certain individuals are more susceptible to colds than others (Wilson and Worcester, 1944), or to the fact that individuals respond to adverse circumstances in different ways.

Habitual truancy can be reasonably discounted in a school of this type; but a conscientious child, who would never dream of wilfully absenting herself from school to avoid an unpleasant experience, might be kept at home because of an opportunely-timed headache, bilious attack, or cold. Such psychosomatic disturbances are not uncommon, and most people must have experienced at some time an ailment which conveniently enabled them to avoid an unpleasant duty. Occurrences which appear trivial to adults often make sensitive children miserable. Recourse to absenteeism to avoid unwelcome contacts may thus produce a disposition to deal with problems by evasion instead of resolution. In schoolchildren it is therefore of some importance to observe those who are frequently absent, no matter how short the duration. Absences due to respiratory disease may indicate that the child is in the early stages of tuberculosis or bronchiectasis; fatigue and debility may indicate anaemia, malnutrition, diabetes, or some serious organic disease. On the other hand, any one set of recurrent symptoms not explicable in terms of organic medicine may show that the child is maladjusted to the school environment, and a sympathetic investigation may elicit a cause which can easily be eradicated. The important fact to recognize is that recurrent absences from school can be regarded as a symptom of some mental or physical disharmony; to treat it in time may decrease the morbidity of organic disease, or the incidence of psychoneurosis and juvenile delinquency.

Detection of Absence Proneness

Many schools maintain separate progress cards for each individual, which show the academic, athletic, and social progress throughout the school; but few schools maintain individual absence record cards. Thus no such case history is available to the school doctor, who rarely has sufficient time to make regular thorough medical examinations of every pupil. The provision of a card showing details of the duration and cause of every absence would prove useful as a guide to history-taking, and would put the school doctor in a position to sift out those children likely to require more detailed examination.

The need for time-saving devices in the case-history taking at school medical examinations was discussed by Gordon (1947), and the usefulness of school

morbidity records as an index of the health of schoolchildren has been stressed in America by several authors, including Downes (1945), and Collins (1928) who writes:

> The school sickness record would serve the double purpose of a continuous record of the health of the child and a criterion for referring children for special examination. Any child who suffers frequent attacks of illness which entail absence from school may well be referred for examination, even though the condition is only a headache, for it will enable the physician to discover in their early and preventable stages physical impairments which otherwise might be serious.

It would therefore seem to be desirable that every absence from school should be accounted for by a note, from the parents if the duration is less than one week, or from a doctor if it is longer. The teacher should enter the duration in days and the cause as in the sample record shown in Fig. 4, a postscript (*D*) or (*P*) showing

NAME		DATE OF BIRTH				DATE OF ENTRY				FORM OF ENTRY				OCCUPATION OF FATHER				
		SCHOOL NUMBER				PREVIOUS SCHOOL								ADDRESS				
FORM	WEEK OF TERM / DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	P A	SUMMARY
																	X	
		3 Influenza	5	5	(D)													
				1 Headache	(P)									(P)	10 Summer Holidays			

FIG. 4.—Absence record card.

whether the note was from doctor or parents. The column headed *P.A.* should be marked *X* at the end of the term if the child has had perfect attendance, otherwise *O*. In this manner a continuous record of the child's absences could be maintained with little more effort than the existing systems entail. Records of this type would enable teachers to pick out children who need a medical examination before the appointed time. If the school absence records were standardized, valuable information could be obtained in the younger age groups respecting:

(1) incidence of various diseases,
(2) estimations of case mortality rates,
(3) health of school populations in different environments.

SUMMARY

(1) The absence and medical records of a large grammar school for girls have been analysed.

(2) The causation of absences incurred by the girls has been examined. The importance of respiratory disease as a cause of absence is discussed.

(3) The association of sexual age with physical development is noted.

(4) It is found that some girls, regardless of their medical history, social environment, or physique, have a predisposition to recurrent absences. This has been called " absence proneness " by analogy with accident proneness.

(5) The possible causation of absence proneness is discussed.

(6) A method of detection of absence proneness by improved school absence records is suggested.

This enquiry was undertaken while I was in receipt of a grant from the Halley Stewart Trust, to which my thanks are due. I should like to take this opportunity of recording my gratitude to the Headmistress of the selected school for making available to me the records used in this survey.

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CHANGING MORTALITY FROM 1841 TO 1947 MEASURED BY THE LIFE TABLE

BY

WALLIS TAYLOR

Central Statistical Office, City of Birmingham

Until the mid-1930s there were wide discrepancies in the expectation of life in four major English-speaking communities, viz. England and Wales, U.S.A., Australia, and New Zealand. The initial aim of this communication was to draw attention to a spectacular, unequal, and concurrent rise, the outcome of which is that the latest figures differ little *inter se*. A closer examination of contributory changes in different age groups prompted the question: in what age groups has the conservation of life during the past century been pre-eminently responsible for the continuous rise of the expectation of life in England and Wales during the same period ? The answer will permit us to see more clearly what age groups can materially participate in further improvement henceforth.

Though we may credit an Englishman, Halley (1693), with the making of the first life table, the data he employed refer to a German city and are grossly defective as regards the age structure of the population. In 1783 Richard Price published a table referable to Northampton, the first of its kind to use British data. Unfortunately the errors in this table enabled the insurance companies to net a small fortune from life insurance, and H.M. government lost £2 million by it.

For British life-table statistics in which we can place much confidence we cannot go back earlier than Farr (1843), though a Table based on deaths for 1774-87 in the city of Carlisle was published by Milne (1815). During the 19th century the procedure changed little, though greater reliability resulted from better registration. There is no need to add what Dublin and others (1949) or Kuczynski (1935) have lately written concerning minor refinements in the technique. The symbols employed below are those now in general use, viz.:

If Δ be the age-group interval adopted (here 1 year for the first 5 years, and 5 years thereafter),

(1) P_x is the proportion per thousand of persons who reach age $x+\Delta$, having themselves attained age x years;
(2) l_x is the number of survivors at age x out of 1,000 at birth;
(3) L_Δ is the mean number of years of survival of the same cohort during the age-group interval (Δ);
(4) T_x is the cumulative number of years of survival by that cohort *after* attaining the age x;
(5) $\mathring{e}_x$ is the mean number of remaining years of life at current mortality rates for persons at age x, so that $\mathring{e}_0$ is the mean number of years of life at birth.

The use of the word *proportion* in this context in preference to *probability* is intentional, as is the avoidance of the customary definition of $\mathring{e}_x$ as the *expectation of life* at x years. It is the writer's standpoint that $\mathring{e}_x$ is essentially a *summarizing index* as are the other entries of the life table, which is collectively a battery of summarizing indices, each with a special significance but all alike referable to a unique historical situation—in contradistinction to a sample in the normal use of the term. Failure to make this distinction clear is perhaps partly responsible for the remarkable neglect of the life-table technique in favour of other and inferior methods of mortality standardization with respect to sex and age in official publications.

In theory, it would be possible to construct a Life Table based on the continuous history of a cohort up to the time of death of the last survivor, but one could not then use the life-table technique as a summary of the contemporary scene. The actual procedure records what the mortality experience of the cohort would be if mortality in each year of life were as at the date to which the table refers. Actually, we have good reason to expect that mortality will decrease during the remaining years of life of people now living. Accordingly the estimated number of years of survival from the life table is not in any meaningful sense the *expectation of life at their birth.* If he subsequently conforms to common usage by using this expression for $\mathring{e}_x$, the present writer does not subscribe to the definition of the Government Actuary, writing on the 1930-1932 Life Tables:

> " the total future life-time which, on an average, will be passed through by each of a group of persons aged exactly x ".

This is crystal-gazing. If mortality rates fall heavily in the future, no amount of averaging will justify this statement.

Although the earlier Life Tables on record refer to cities (a practice followed by Farr (1875) in his selected tables for *Healthy Districts*), the contemporary ones are normally* available only for national units, though the technique calls for no data other than that required for any reliable method of standardization, in particular the age and sex structure of the population. In view of the wealth of neglected and diverse information summarized in the life-table battery, it is regrettable that the Registrar-General's *Statistical Review* does not make available an age and sex breakdown of the population of England and Wales for cities and other units of local government.†

The life-table technique has certain limitations from the viewpoint of social medicine in that it is not pre-eminently suitable for the study of occupational

* The 1931 tables from the office of the Registrar-General do, however, include one for Greater London.

† This study developed from a comparison of life tables for England and Wales and for Birmingham, computed for the analysis of migration and the age structure of future populations. Such research is severely handicapped by the lack of local sex and age estimates, since there is a gap between 1931 and 1947. It is interesting to note, therefore, that the population of the City of Birmingham is now 1,107,200 (1949) and the population of New Zealand (non-Maori) 1,802,000 (1947). The published statistics in no way reflect the comparability.

differentials; but Dublin and others (1949) showed that its uses are more diverse than its customary identification with the assessment of insurance premiums by estimating man-years lost by premature decease due to particular diseases. Since we are about to compare life-table statistics of different natural communities, it is appropriate to comment upon certain difficulties which beset such comparison. It is all too customary to identify the use of the Life Table with the information embodied in the single summarizing index $\mathring{e}_0$. It may, however, happen in some statistically backward countries that portions of the Life Table vary in accuracy. Some portions may even be omitted, as in Canada in 1931, where the errors in registration for the first 5 years of life were known to be large and the Life Table was started at age five.

The problem arises, therefore, of choosing the relevant part for comparison. Certainly for general comparison $\mathring{e}_0$ is the best value, but if birth registration is known to be inefficient, it may be far better to compare $\mathring{e}_5$ or a later value. If infant welfare is our main preoccupation, $\mathring{e}_0$ can be compared with $\mathring{e}_1$. If $\mathring{e}_1$ is much larger than $\mathring{e}_0$ then high infant mortality is taking place; if $\mathring{e}_1$ is less by nearly one year, then infant mortality is very low. If our concern is to compare the potential reproductive powers of each community, it may be most interesting to set side by side survivors at the end of the reproductive period from cohorts of equal size at the beginning of it.

Before we turn to consider the changing incidence of mortality between 1930-1932 and 1946-1948, it is perhaps politic to point out that by the nature of its construction this index does not show the loss of life directly due to the intervening war. This is perhaps a further reason for avoiding the term " expectation of life ". The years of life lost by causes directly attributable to the war can, of course, be ascertained from a Life Table in the same way as the loss of years due to accident or a specific disease. Farr (1875) attempted this for zymotic diseases, phthisis, and cancer, and he quoted the work of Duvillard (1806), who estimated the loss of life due to smallpox in Paris in 1806 as 3·5 years. No more recent publication by the Registrar-General using this type of calculation is known to the author.

It is in the international comparison of mortality that the value of the Life Table is so clearly demonstrated. Its adoption would dispense with any need for international agreement on a " standard " population, and would not be open to the objections which the choice of any such standard incurs when the communities concerned differ widely in population structure.

The Contemporary Life Table of Four English-Speaking Communities

No Official British Life Table has appeared since 1931. Appendix A cites the writer's procedure for the construction of an abridged table for England and Wales referable to the years 1946-48 (Table I, opposite). The outstanding changes between these two dates are described below.

First and foremost is a very great increase in $\mathring{e}_0$ for both sexes. Over these

TABLE I

LIFE TABLE 1946–1948, ENGLAND AND WALES

Exact Age	P_x	l_x	$L_\triangle$	T_x	$\mathring{e}_x$
Males					
0	955·98	1,000·00	964·51	65,317·99	65·32
1	996·63	955·98	954·37	64,353·48	67·32
2	997·98	952·76	951·79	63,399·12	66·54
3	998·51	950·83	950·12	62,447·33	65·68
4	998·72	949·42	948·81	61,497·20	64·77
5	995·23	948·20	4,729·68	60,548·40	63·86
10	996·25	943·67	4,709·52	55,818·71	59·15
15	992·37	940·13	4,682·74	51,109·19	54·36
20	990·97	932·96	4,643·75	46,426·45	49·76
25	990·89	924·54	4,601·62	41,782·70	45·19
30	989·29	916·11	4,556·06	37,181·08	40·59
35	986·66	906·31	4,501·30	32,625·03	36·00
40	980·19	894·21	4,426·78	28,123·72	31·45
45	967·12	876·50	4,310·47	23,969·94	27·04
50	947·24	847·69	4,126·62	19,386·47	22·87
55	916·72	802·96	3,847·63	15,259·86	19·00
60	870·20	736·09	3,441·61	11,412·22	15·50
65	815·30	640·55	2,906·96	7,970·61	12·44
70	729·12	522·24	2,257·53	5,063·66	9·70
75	605·98	380·77	1,528·78	2,806·12	7·37
80	447·01	230·74	834·71	1,277·34	5·54
85	297·02	103·14	334·45	442·63	4·29
90	199·95	30·64	91·90	108·19	3·53
95	31·65	6·13	15·80	16·28	2·66
100	—	0·19	0·48	0·49	2·50
Females					
0	965·87	1,000·00	972·76	70,046·04	70·05
1	997·03	965·87	964·44	69,073·28	71·51
2	998·29	963·00	962·18	68,108·85	70·73
3	998·80	961·36	960·78	67,146·67	69·85
4	999·04	960·21	959·74	66,185·89	68·93
5	996·49	959·28	4,787·98	65,226·15	68·00
10	996·98	955·91	4,772·33	60,438·16	63·23
15	994·14	953·02	4,751·13	55,665·84	58·41
20	991·27	947·43	4,716·50	50,914·70	53·74
25	990·92	939·17	4,674·51	46,198·21	49·19
30	990·09	930·64	4,630·12	41,523·70	44·62
35	988·62	921·41	4,580·86	36,893·58	40·04
40	984·93	910·93	4,520·33	32,312·71	35·47
45	977·50	897·20	4,435·53	27,792·39	30·98
50	966·78	877·01	4,312·23	23,356·85	26·63
55	951·33	847·88	4,136·22	19,044·63	22·46
60	923·48	806·61	3,878·74	14,908·41	18·48
65	880·29	744·89	3,501·52	11,029·67	14·81
70	801·49	655·72	2,953·18	7,528·14	11·48
75	688·10	525·55	2,217·95	4,574·97	8·70
80	540·89	361·63	1,393·07	2,357·02	6·52
85	384·00	195·60	676·78	963·95	4·93
90	245·06	75·11	233·79	287·16	3·82
95	80·00	18·41	49·70	53·38	2·90
100	—	1·47	3·68	3·68	2·50

16 years $\mathring{e}_0$ for males increased by 6·62 from 58·70 to 65·32 years, and for females by 7·17 from 62·88 to 70·05 years. In view of the economic and international upheavals of this period, this is a remarkable achievement. It prompts us, therefore, to consider the international scene to see whether or not it is an isolated phenomenon. From the United Nations Demographic Year Book (1948) we pick out three other countries which approach ethnic similarity, the U.S.A. (white), Australia (non-Aborigine), and New Zealand (non-Maori). To bring this picture up to date we have used Life Tables for 1947, computed by the Metropolitan Life Insurance Company, New York.*

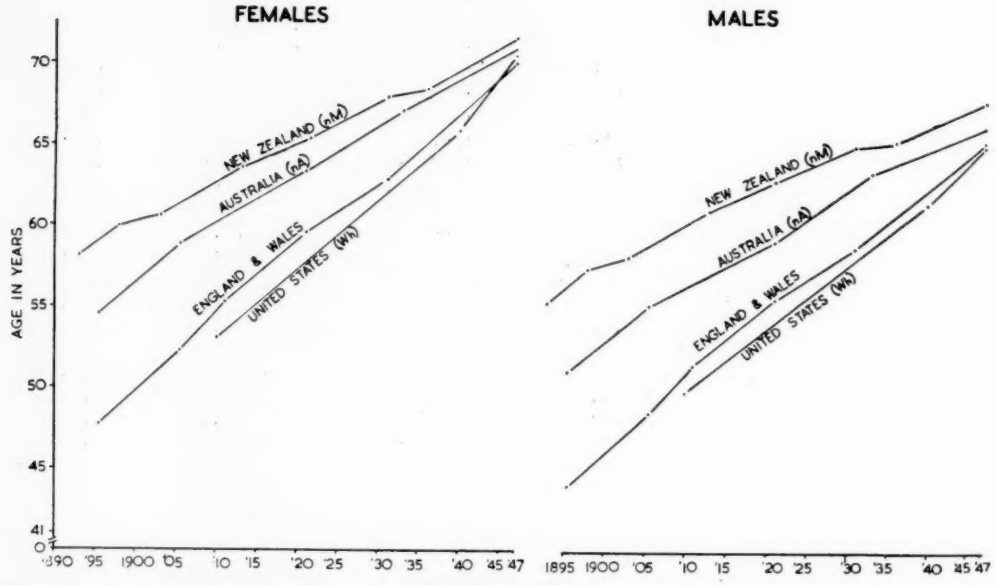

FIG. 1.—Historical comparison of $\mathring{e}_0$ in English-speaking communities (white population only).

Fig. 1 shows that all four countries have reached a similar standard measured by $\mathring{e}_0$, although their progression to that level is dissimilar. In fact, perhaps the most surprising change is the closure of the gap between these four countries. In about 1910 the range for males was 10 years, and by 1947 it was only 2·16 years; for females it decreased from about 9 to 1·6 years. New Zealand (nM) and Australia (nA) are still in the lead, but the U.S.A. (Wh) and England and Wales (following very similar paths) have now bridged most of the gulf which previously existed between them and the countries of the Southern hemisphere.

We can get the nature of this convergence into better focus if we compare the measures of mortality derived from the Life Table (Tables II and III). Both l_x and $\mathring{e}_x$ are given, since they are in a sense complementary. The former relates the experience of the cohort 0 to x, and the latter that of all ages greater than x. The three foreign tables are for the year 1947 alone. Computed on a similar basis,

* These figures are printed here by the courtesy of Dr. L. I. Dublin.

TABLE II

INTERNATIONAL COMPARISON OF LIFE-TABLE SURVIVORS

Exact Age	England and Wales (1946–48)	Australia (nA) (1947)	New Zealand (nM) (1947)	U.S.A. (Wh) (1947)
Males				
0	100,000	100,000	100,000	100,000
1	95,598	96,827	97,275	96,550
5	94,820	96,040	96,592	95,932
10	94,367	95,549	96,202	95,558
15	94,013	95,203	95,909	95,185
20	93,296	94,556	95,394	94,509
25	92,454	93,754	94,453	93,611
30	91,611	92,966	93,677	92,694
35	90,631	92,047	92,827	91,609
40	89,421	90,848	91,798	90,061
45	87,650	88,975	90,467	87,701
50	84,769	86,071	87,870	84,158
55	80,296	81,123	83,687	78,763
60	73,609	74,447	77,501	71,477
65	64,055	64,863	68,789	61,728
70	52,224	52,598	56,694	49,512
75	38,077	38,554	41,887	35,881
80	23,074	23,439	25,856	22,347
Females				
0	100,000	100,000	100,000	100,000
1	96,587	97,488	97,728	97,350
5	95,928	96,850	97,077	96,834
10	95,591	96,572	96,923	96,573
15	95,302	96,330	96,749	96,341
20	94,743	95,989	96,343	95,965
25	93,917	95,463	95,773	95,476
30	93,064	94,737	95,030	94,884
35	92,141	93,889	94,280	94,115
40	91,093	92,747	93,325	93,042
45	89,720	91,246	92,190	91,525
50	87,701	89,150	90,033	89,301
55	84,788	85,867	87,040	86,050
60	80,661	81,565	82,639	81,464
65	74,489	75,182	76,546	74,678
70	65,572	65,911	67,566	64,589
75	52,555	53,027	54,734	51,142
80	36,163	36,646	37,991	35,293

the English tables would give slightly lower values than appear here, since in 1947 England and Wales experienced higher mortality at almost all ages than in either 1946 or 1948. It is clear that mortality experience in all age groups is now very similar in the four countries under discussion. Mortality of males is throughout heavier in England and Wales than in Australia (nA) or in New Zealand (nM) except that it appears to be slightly below that of New Zealand (nM) above age 80, but the difference here is trivial. Conversely, the summation of mortality gives a higher mortality figure to the U.S.A. (Wh), and of the cohort only 22,347 survive to age 80 against 23,074 in England and Wales. If we take the two tables together it is easy to see that the change occurs after age 45, more surviving to this age in

TABLE III

1947 $\mathring{e}_x$

Exact Age	England and Wales (1946–48)	Australia (nA) (1947)	New Zealand (nM) (1947)	U.S.A. (Wh) (1947)
Males				
0	65·32	66·30	67·77	65·16
1	67·32	67·47	68·67	66·48
5	63·86	64·01	65·14	62·91
10	59·15	59·32	60·39	58·14
15	54·36	54·52	55·57	53·36
20	49·76	49·88	50·85	48·72
25	45·19	45·28	46·33	44·17
30	40·59	40·64	41·70	39·58
35	36·00	36·02	37·05	35·02
40	31·45	31·46	32·43	30·57
45	27·04	27·07	27·87	26·32
50	22·87	22·89	23·61	22·32
55	19·00	19·13	19·66	18·67
60	15·50	15·60	16·02	15·30
65	12·44	12·52	12·71	12·31
70	9·70	9·83	9·87	9·71
75	7·37	7·48	7·45	7·44
80	5·54	5·71	5·53	5·45
Females				
0	70·05	70·92	71·62	70·54
1	71·51	71·74	72·28	71·46
5	67·99	68·20	68·75	67·83
10	63·23	63·38	63·86	63·01
15	58·41	58·53	58·98	58·16
20	53·74	53·73	54·22	53·37
25	49·19	49·01	49·53	48·63
30	44·62	44·36	44·90	43·92
35	40·04	39·74	40·23	39·26
40	35·47	35·19	35·62	34·68
45	30·98	30·72	31·02	30·21
50	26·63	26·38	26·70	25·90
55	22·46	22·29	22·52	21·77
60	18·48	18·33	18·58	17·85
65	14·81	14·66	14·85	14·23
70	11·48	11·35	11·47	11·04
75	8·70	8·48	8·55	8·26
80	6·52	6·13	6·20	5·83

U.S.A. but less at all higher ages. This indicates lower mortality in England and Wales compared with the U.S.A. (Wh) for older age groups, but a higher mortality for younger age groups. For life as a whole mortality is slightly less in England and Wales. Over all, however, it is obvious that mortality experience is very similar in these two countries, the summarizing index $\mathring{e}_0$ being 65·16 for the U.S.A. (Wh) and 65·32 for England and Wales. In the female tables, England and Wales appear to advantage in several parts, but the total mortality is less favourable than in any of the other countries. Approximately the same relationship as that seen for males also holds for females between England and Wales and the U.S.A. (Wh), but here the change comes later, at about 65 years of age.

ENGLISH LIFE-TABLE STATISTICS THROUGHOUT THE 20TH CENTURY

The foregoing comparison prompts the question: how far does the character of mortality experience in England and Wales during the last two decades signalize a new trend ? Fig. 2 shows the summarizing index $\mathring{e}_0$ for both sexes, but for a closer scrutiny we may usefully supplement the conventional contents of the Life Table by recourse to a statistic based on l_x and T_x as defined above. This is the

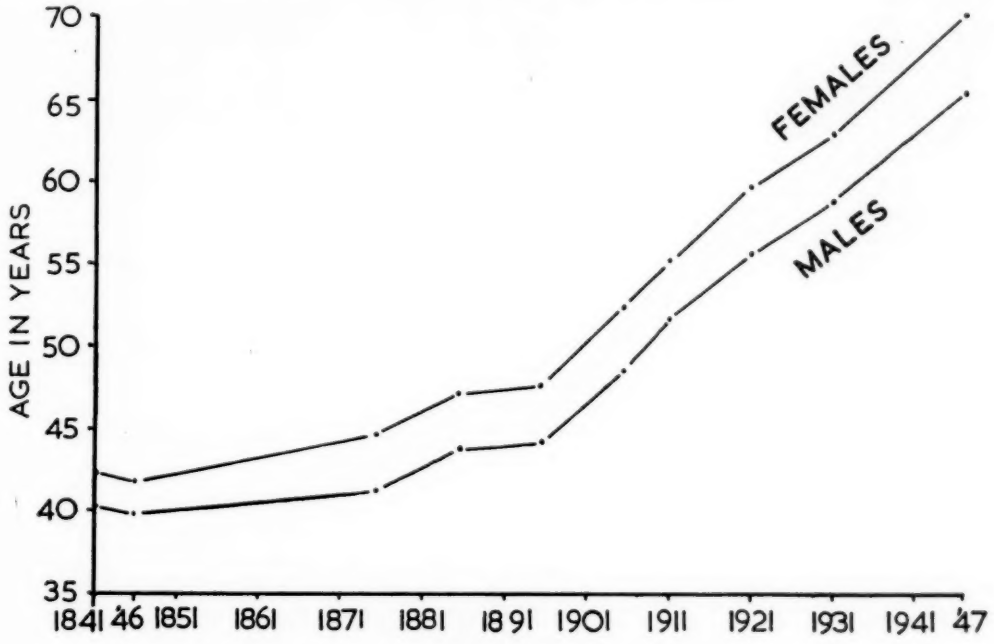

FIG. 2.—$\mathring{e}_0$ for England and Wales 1841-1947.
Source 1841-1931 English Census Life Tables.
1947 Abridged Life Tables.

ratio $Z_x = L_\Delta \div l_x$, being therefore the mean years of *survival* within the age group x to $x+\Delta$. As such, it must lie between the limits 0 and Δ. Consequently we can assign for each age group *a measure of mortality with a definable maximum.* Having done so, we are better able to see clearly in what age groups conservation of life has been most effective *vis-à-vis* the total expectation, and can henceforth accomplish little improvement.

The statistic Z_x, like P_x, summarizes the mortality experience of a particular age group at a point in time but from a different viewpoint. The latter tells us what proportion of *persons* survive throughout the interval. The former expresses the saturation level in terms of what proportion of the realizable *span* is still a target for conservation. P_x is therefore restricted to periods where the mortality rate is constant, i.e. short periods where the rate might justifiably be represented by a straight line. Z_x is not so restricted and may be used for comparing age periods of any size, provided those periods have the same realizable maximum Δ. For

TABLE IV

Z_x

Year	1841	1838–54	1871–80	1881–90	1891–1900	1901–10	1910–12	1920–22	1930–32 (abridged)	1946–48 (estimated)	Maximum
Table No.	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)			
Males											
0–1	0·91	0·89	0·92	0·90	0·89	0·89	0·91	0·95	0·95	0·96	1
1–4	3·67	3·64	3·67	3·72	3·74	3·80	3·83	3·88	3·92	3·98	4
5–9	4·85	4·86	4·90	4·93	4·93	4·95	4·95	4·96	4·97	4·99	5
10–19	9·71	9·74	9·81	9·88	9·87	9·89	9·90	9·90	9·91	9·95	10
20–29	9·58	9·58	9·66	9·72	9·74	9·79	9·81	9·81	9·84	9·91	10
30–39	9·46	9·48	9·49	9·54	9·61	9·68	9·72	9·75	9·81	9·89	10
40–59	17·15	16·99	16·78	16·94	17·04	17·48	17·73	18·12	18·26	18·69	20
60–79	12·46	12·42	12·12	11·97	12·00	12·41	12·63	13·10	13·23	13·77	20
80 and over	4·94	4·93	4·79	4·52	4·62	4·86	4·90	4·93	4·80	5·54	20
Females											
0–1	0·94	0·91	0·93	0·92	0·91	0·92	0·93	0·96	0·96	0·97	1
1–4	3·67	3·65	3·68	3·73	3·76	3·81	3·84	3·89	3·93	3·98	4
5–9	4·86	4·87	4·90	4·93	4·93	4·95	4·95	4·96	4·97	4·99	5
10–19	9·70	9·72	9·82	9·89	9·86	9·89	9·90	9·89	9·92	9·96	10
20–29	9·57	9·56	9·66	9·72	9·77	9·82	9·84	9·84	9·86	9·91	10
30–39	9·47	9·46	9·55	9·58	9·65	9·72	9·77	9·80	9·83	9·90	10
40–59	17·37	17·25	17·36	17·49	17·60	17·97	18·19	18·54	18·70	19·11	20
60–79	13·02	12·96	12·90	12·85	12·84	13·47	13·79	14·32	14·58	15·56	20
80 and over	5·19	5·26	5·20	5·00	5·05	5·36	5·49	5·56	5·48	6·52	20

one age group (80 and over) we cannot assign an exact maximum, since Δ is indefinite. For purposes of comparison, however, we may arbitrarily define our Δ as 20 years, on the assumption that the proportion of centenarians among survivors to the age of 80 may remain trivial for many years ahead.

Table IV exhibits the actual Z_x statistic calculated from the English Life Tables of 1841 onwards, and Table V (opposite) presents essentially the same picture in a more easily assimilable form, the figures being weighted to the same maximum (100). This statistic we denote by the symbol R_x. It will suffice to state the outcome in general terms, without emphasizing qualifications which the reader may judge appropriate by inspection of the figures cited in Tables IV and V, and of the graphs in Figs 3 and 4 (overleaf).

Phase 1.—For males from 1840 to 1900, with due regard for errors in death registration during this period, a steady improvement is noticeable in all age groups from 1 to 39, but none in the first year of life or in the age groups 40 and over.

Phase 2.—For males in the decade 1900-10 the steady improvement already noted

TABLE V

R_x

Year	1841	1838–54	1871–80	1881–90	1891–1900	1901–10	1910–12	1920–22	1930–32 (abridged)	1946–48 (estimated)	Maximum
Table No.	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)			
Males											
0–1	91·8	89·2	92·0	89·9	89·1	89·4	91·1	95·4	94·5	96·5	100
1–4	91·5	90·9	91·8	92·9	93·5	95·1	95·8	96·9	98·0	99·5	100
5–9	97·1	97·2	97·9	98·5	98·7	99·0	99·0	99·3	99·4	99·8	100
10–19	97·1	97·4	98·1	98·8	98·7	98·9	99·0	99·0	99·1	99·5	100
20–29	95·8	95·8	96·6	97·2	97·4	97·9	98·1	98·1	98·4	99·1	100
30–39	94·7	94·8	94·9	95·4	96·1	96·8	97·2	97·5	98·1	98·9	100
40–59	85·7	85·0	83·9	84·7	85·2	87·4	88·6	90·6	91·3	93·4	100
60–79	62·3	62·1	60·6	59·8	60·0	62·0	63·2	65·5	66·1	68·8	100
80 and over	24·7	24·6	23·9	22·6	23·1	24·3	24·5	24·6	24·0	27·7	100
Females											
0–1	93·5	91·3	93·5	91·9	91·3	91·6	93·0	96·3	96·5	97·3	100
1–4	91·8	91·3	92·0	93·4	93·9	95·3	96·0	97·2	98·2	99·6	100
5–9	97·1	97·4	98·0	98·6	98·7	99·0	99·0	99·2	99·5	99·8	100
10–19	97·0	97·2	98·2	98·9	98·6	98·9	99·0	98·9	99·2	99·6	100
20–29	95·7	95·6	96·6	97·2	97·7	98·2	98·4	98·4	98·6	99·1	100
30–39	94·7	94·6	95·5	95·8	96·5	97·2	97·7	98·0	98·3	99·0	100
40–59	86·8	86·3	86·8	87·5	88·0	89·9	90·9	92·7	93·5	95·5	100
60–79	65·1	64·8	64·5	64·3	64·2	67·3	68·9	71·6	72·9	77·8	100
80 and over	25·9	26·3	26·0	25·0	25·2	26·8	27·4	27·8	27·4	32·6	100

in the age group 1 to 39 inclusive continues, being most noticeable in the age group 1 to 4, but we now see the beginning of a steady increase in the conservation of life in the first year and in the two decades 40 to 59.

Phase 3.—For males between 1911 and 1931 the increased conservation of life in the first year increases to a more spectacular degree, though not consistently. Increased conservation of life in the age group 1 to 59 continues, and we first note a consistent improvement in the next 20 years, viz. 60 to 79. For the terminal age group (80 and over) the 1931 figure is lower than at any time in the 20th century.*

* During this period there is an apparent fall from 1921 to 1931 in the figure for the conservation of life for males under one year of age. The method of calculation now used by the Government Actuary groups deaths in the first year of life by quarterly intervals. The more refined technique now generally adopted and here used for 1931 and 1947 is to group deaths 0-1 month, 1-3 months, 3-6 months, and 6-12 months. It is clear from the original data that neither policy has been followed consistently in the past, and that the statistics for the first year of life must be suspect until 1931. The effect of coarser grouping is to over-estimate the apparent conservation of life, since infant mortality is always greater in the immediate postnatal period. Thus the Official Life Table for 1931 would give $R_x = 96 \cdot 3$ male and $97 \cdot 2$ female in place of the $94 \cdot 5$ and $96 \cdot 5$ in Table V. It is a merit of the R_x statistic that these deviations do not invalidate values at other ages in the Life Table. Since the recent past is of greater interest, it has been thought preferable to provide the correct figures for these dates although they are not strictly comparable with the earlier values for the first year of life.

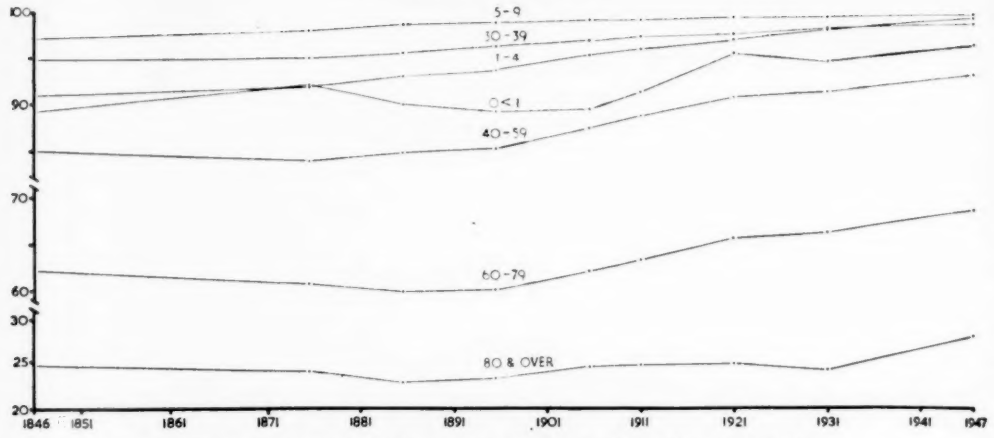

FIG. 3.—R_x statistic for males, England and Wales, 1846-1947.

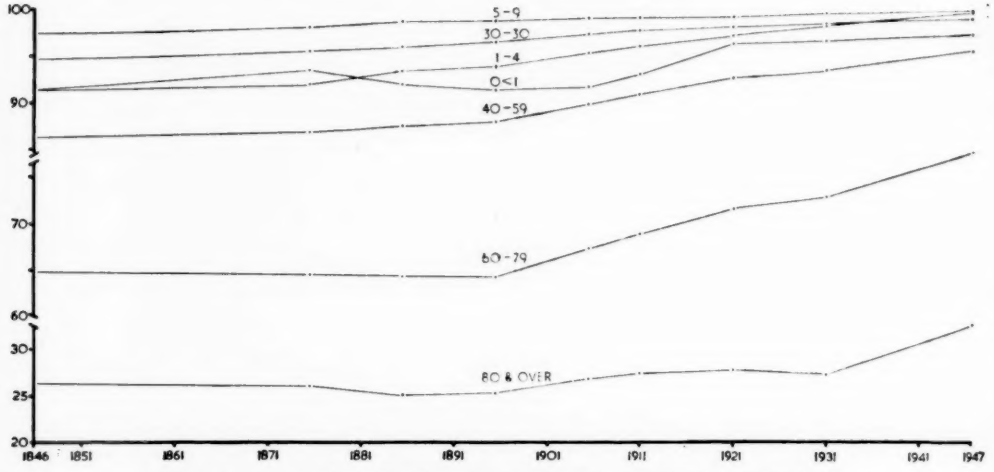

FIG. 4.—R_x statistic for females, England and Wales, 1846-1947.

Phase 4.—For males the 1947 table, here set forth for the first time, would appear to signalize a new phase, the outstanding characteristic of which is a uniform increased conservation in all age groups, and its most diagnostic feature a spectacular rise in the oldest age group of all.

Broadly speaking, the foregoing remarks apply also to females, with two outstanding exceptions:

(*a*) the expectation of survival in the terminal age group, although less in 1931 than in 1921 or 1911, is greater than for the 1900-10 period,

(*b*) the steady improvement which began after 1910 with respect to males of the age group 60 to 79 was already manifest in the previous decade (1901-10).

It should be noted at this point that whilst it is legitimate to compare historical series of R_x with any size of age group, it is only legitimate to use age groups of

equal size at a given point of time. This is because, by the nature of its construction, the survivors are taken at the mean age of the group, so that each additional year brings a successively smaller increase of $L_{\triangle}$. Table VI, therefore, gives the values of Z_x for the 20th century in five vicennial groups, and Table VII gives the R_x values.

TABLE VI

Z_x FROM 1901–10 TO 1946–48

Year			1901–10	1910–12	1920–22	1930–32 (abridged)	1946–48 (estimated)
Sex and Age Group ..	Male	0–19	15·80	16·41	17·28	17·88	18·89
		20–39	19·04	19·15	19·19	19·33	19·62
		40–59	17·48	17·73	18·12	18·26	18·69
		60–79	12·41	12·63	13·10	13·23	13·77
		80 and over	4·86	4·90	4·93	4·80	5·54
	Female	0–19	16·33	16·88	17·70	18·28	19·13
		20–39	19·18	19·28	19·30	19·40	19·63
		40–59	17·97	18·19	18·54	18·69	19·11
		60–79	13·47	13·79	14·32	14·58	15·56
		80 and over	5·36	5·49	5·56	5·48	6·52

TABLE VII

R_x FROM 1901–10 TO 1946–48

Year			1901–10	1910–12	1920–22	1930–32 (abridged)	1946–48 (estimated)
Sex and Age Group ..	Male	0–19	79	82	86	89	94
		20–39	95	96	96	97	98
		40–59	87	89	91	91	93
		60–79	62	63	65	66	69
		80 and over	24	24	25	24	28
	Female	0–19	82	84	88	91	96
		20–39	96	96	96	97	98
		40–59	90	91	93	93	96
		60–79	67	69	72	73	78
		80 and over	27	27	28	27	33

CONCLUSIONS

The new life-table statistic Z_x and its derivative ratio R_x introduced in the foregoing treatment brings sharply into focus a conclusion which one might otherwise infer from mortality trends but with scarcely so much confidence.

The 1947 R_x values force upon our attention the conclusion that we are rapidly reaching saturation point with regard to the conservation of life in every age group under 60 years. Henceforth, therefore, any *continued* increase of expectation of life at birth can come about, in the main, only from a lowering of the risk of death in the older age groups.

That the increased expectation of life is due to the survival by more persons to a maximum span of life and not to an extension of the span by a few, is clearly shown by a comparison of l_x, the survivors of the Life Table. Half the males who start

the course have died by age 67·2 in the 1930-32 Table, but half survive to 70·8 in the 1946-48 Table. For females in the same period a similar effect is apparent, and here the change is from 71·3 to 75·8.

If we ask ourselves how big an increase in the conservation of life in the terminal age groups is conceivable, it is not likely that the limiting value for males will be below the present level for females. If so, a comparison of the R_x values for males and females in 1947 is revealing. The present figure for males in the 40 to 59 age group (Table V) tallies closely with the figure for females in 1931. Now, from 1911 to 1947, the rise in the figure for females in the age groups 40 to 59, 60 to 79, and 80 and over, has been 4·6, 8·9, and 5·2 per cent. respectively. The total expectation of life has risen during this period from 55·35 to 70·05 years. Meanwhile, the proportion of females surviving to age 40 has increased from 75 to 91·1 per cent., and to age 60 from 58·7 to 80·7 per cent. From the latest figures (i.e. 1946-48) the R_x values for females exceed those for males in the three terminal age groups by 2·1, 9·0, and 4·9 per cent. respectively.

This brings us to an issue hotly contested by writers of the eugenics school, in particular Karl Pearson and Raymond Pearl. The former long maintained that conservation of life in the early years must on the whole promote the survival of individuals destined to succumb more readily than others at a more advanced age. He therefore argued that there must eventually be a fall in the expectation of life in the terminal age groups and sought confirmation for this view (Pearson, 1902, 1912; McDonnell, 1913) in an ingenious manipulation of highly dubious data concerning the age at death of Egyptian mummies and Roman remains.

In this study we have seen evidence of a sustained increase in the expectation of life at ages over 60 for a period of nearly half a century, and the new figures presented indicate the possibility of a substantial improvement in the age group 80 and over. In view of the highly controversial nature of this issue, therefore, it is important to scrutinize the last conclusion with due regard to certain adjustments of the relevant data rendered necessary because the populations are not divisible after age 84 in the crude data supplied by the Registrar-General. Our task would thus be incomplete if we did not supplement the foregoing tables with a scrutiny of the two terminal quinquennials for which our figures are complete. Accordingly, Table VIII shows the value of R_x for these groups.

TABLE VIII

R_x FROM 1841 TO 1946–48

Year ..	1841	1838–54	1871–80	1881–90	1891–1900	1901–10	1910–12	1920–22	1930–32	1946–48
Males										
75–79	77	76	76	75	75	76	76	77	77	80
80–84	68	68	67	66	66	68	68	68	69	72
Females										
75–79	78	78	78	77	77	79	80	81	81	84
80–84	70	70	70	69	69	71	71	72	73	77

It might justly be said that the outcome of this examination emphasizes the temerity of making forecasts of human affairs on the basis of the theory of natural selection, without due regard to man's ability to generate his own environment. The work of Enid Charles and others has accustomed us to anticipate an ageing population as a consequence of greatly diminished fertility accompanying a fall of mortality in the age groups under 60; but known facts hitherto have not forced intelligent anticipation of this sort, albeit arresting, to envisage the outcome of any spectacular fall of mortality in the older age-groups. That we may indeed expect a substantial conservation of life, at least up to the limit at which human beings retain any power to contribute to the working life of the community, is a prospect with far-reaching social consequences. We may now expect that advancing medical science and improved social conditions will conspire to increase the tempo of the ageing of the population, a prospect already recognized by demographers as the inescapable outcome of lower fertility. Whereas fertility must not fall below its present level if the population is to maintain itself, we can foresee no early arrest to a process which will inevitably increase the proportion of old age pensioners in the population.

Acknowledgements are due to Dr. Enid Charles, and to Professor L. Hogben, F.R.S., for advice and criticism.

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TECHNICAL APPENDIX

CONSTRUCTION OF THE 1946-1948 LIFE TABLE

It is advisable to calculate Life Tables from census material if available, since accurate sources are important. The tables for 1946-1948 are based, however, on the Registrar-General's Estimate of Civilian Population at December 31, 1947, and Civilian Deaths in the years 1946, 1947, and 1948. Needless to say, there is no absolute reason why a 3-year average of deaths should be used. It was adopted first for the 1911 Census Life Tables (English Life Table No. 8), Life Table No. 7

being based upon the censuses of 1901 and 1911, and the deaths from 1901 to 1910. The 3-year average has the advantage of giving a closer approximation to current mortality without the disadvantage of allowing the choice of one particular abnormal year to give a false view of contemporary mortality.*

It was decided to use the Kuczynski method for this purpose because the implications of the Reed-Merrell and Greville methods are less apparent. Since by the nature of the data the 1946-48 tables are abridged, a similar table was computed for the 1930-32 period for comparison. The differences between this table and the complete table of the Registrar-General for 1930-32 were found to be trivial, except for the first year of life.

In computing Life Tables for this period, three points are noteworthy:

(1) Since deaths by age are only obtainable for the calendar year as a whole, it is clear that the estimates are not at exactly the mid-point of the period of deaths. It has been assumed, therefore, that estimates of population as at June 30, 1947, would have given the same age groups as those actually found 6 months later. Since P_0 to P_5 were computed after an examination of births, this assumption does not introduce any serious error.

(2) In this period, H.M. forces consist of their pre-war regular embodiment (comparable to 1931), a number of re-engaged conscripts, and the 18 to 20-year-old National Servicemen. The use of civilian death and population statistics tends to overweight the mortality of males in the 15 to 19 and 20 to 24 age groups, but the effect is small. The cumulative effect is slightly to decrease the $\mathring{e}_x$ at these and earlier ages.

(3) Some approximation has to be made to the tail of the life table, since the Registrar-General's estimates have the terminal group " 85 and over ". This tail adds 0·7 per cent. and 1·4 per cent. to the T_x for males and females respectively, and it is clear that no appreciable error is introduced in this necessary adjustment. In general, however, the values for all ages over 84 should be regarded as approximations.

There is a dearth of other calculations based on Life Tables over this period. The Royal Commission on Population (1950) published a Hypothetical Life Table for 1942-44, but, as the memorandum states:

" the table is essentially hypothetical in character ".

Lessof (1949) gives $\mathring{e}_0$ for England and Wales in 1936-38, but it is impossible to agree with these figures which show a lower value for females than those of the Registrar-General for 1931 and 1938.

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* The danger of basing conclusions on a single year's mortality is exemplified by Logan (1950). Here a decrease in mortality rates for age group 85 and over for males is shown to be 2 per cent. from 1921/25 until 1947. Had the writer used 1946 figures, the decrease would have been 12 per cent., and with 1948 statistics it would have been 19 per cent.

Brit. J. soc. Med. (1951), **5**, 177-183

OBSERVATIONS ON ALL BIRTHS (23,970) IN BIRMINGHAM, 1947*

III. SURVIVAL

BY

J. R. GIBSON and THOMAS McKEOWN

From the Department of Social Medicine, University of Birmingham

Observations previously published on the duration of gestation (Gibson and McKeown, 1950) and birth weight (McKeown and Gibson, 1951) lend themselves to an examination of the association between these variables and foetal mortality. Data available for single births in Birmingham during 1947 are exhibited in Table I, separately for stillbirths, first-year deaths, and births which survived to the end of the first year of life. We have previously discussed the representativeness of these records, and need here note only that there are no conspicuous differences between the proportions complete in each of the three classes.

TABLE I

DATA AVAILABLE FOR ALL SINGLE BIRTHS (23,279) BORN IN BIRMINGHAM, 1947

Data Available	Stillbirths		First-Year Deaths		Births surviving the First Year		Total Births	
	Number	Per cent.	Number	Per cent.	Number	Per cent.	Number	Per cent.
Birth Weight	518	98·3	754	98·6	21,255	96·7	22,527	96·8
Birth Weight and Duration of Gestation ..	412	78·2	570	74·5	16,163	73·5	17,145	73·7
All Single Births	527	100	765	100	21,987	100	23,279	100

* This research was assisted by a grant from the Birmingham University Students' Social Services Fund.

TABLE II

INCIDENCE OF STILLBIRTH AND DEATH IN THE FIRST YEAR OF LIFE RELATED TO DURATION OF GESTATION

Duration of Gestation (completed weeks)	Total Births (*a*)	Stillbirths (*b*)		First-Year Deaths (*c*)		(*b*)+(*c*)	
		Number	Percentage of (*a*)	Number	Percentage of (*a*)	Number	Percentage of (*a*)
28	16	3	18·7	12	75·0	15	93·7
29	16	8	50·0	7	43·7	15	93·7
30	23	8	34·8	9	39·1	17	73·9
31	50	17	34·0	20	40·0	37	74·0
32	44	13	29·5	11	25·0	24	54·5
33	76	18	23·7	15	19·7	33	43·4
34	111	9	8·1	19	17·1	28	25·2
35	266	23	8·6	26	9·8	49	18·4
36	435	28	6·4	25	5·7	53	12·2
37	762	26	3·4	29	3·8	55	7·2
38	1,485	45	3·0	47	3·2	92	6·2
39	3,394	51	1·5	80	2·4	131	3·9
40	4,784	59	1·2	117	2·4	176	3·7
41	3,019	31	1·0	60	2·0	91	3·0
42	1,423	37	2·6	31	2·2	68	4·8
43	497	11	2·2	9	1·8	20	4·0
44	231	6	2·6	4	1·7	10	4·3
45	112	4	3·6	2	1·8	6	5·4
46	5	—	—	—	—	—	—
All Births of known Duration of Gestation and Weight ..	16,749*	397	2·4	523	3·1	920	5·5
All Births of known Weight	22,454	514	2·3	720	3·2	1,234	5·5

* Of 17,145 births for which duration of gestation and birth weight were known, 73 were excluded because the duration of gestation was less than 28 weeks, and 323 as indicated in Part II of this study.

Tables II and III relate the incidence of stillbirth and death in the first year of life to duration of gestation and birth weight respectively, and give the percentage of total births which died before the first birthday. We may note the following facts:

(*a*) Mortality rates are highly correlated with birth weight and with duration of gestation.

(*b*) Few infants survive if born before the completion of 30 weeks' gestation, and none at less than 2 lb. in weight.

(*c*) Mortality rates diminish rapidly with each completed week of gestation

TABLE III

INCIDENCE OF STILLBIRTH AND DEATH IN THE FIRST YEAR OF LIFE RELATED TO BIRTH WEIGHT

Birth Weight (lb.)	Total Births (*a*)	Stillbirths (*b*)		First-Year Deaths (*c*)		(*b*)+(*c*)	
		Number	Percentage of (*a*)	Number	Percentage of (*a*)	Number	Percentage of (*a*)
1 –	4	2	50·0	2	50·0	4	100·0
1½–	19	11	57·9	8	42·1	19	100·0
2 –	49	23	46·9	23	46·9	46	93·9
2½–	60	30	50·0	21	35·0	51	85·0
3 –	68	25	36·8	20	29·4	45	66·2
3½–	89	29	32·6	22	24·7	51	57·3
4 –	170	31	18·2	32	18·8	63	37·0
4½–	223	28	12·6	28	12·6	56	25·1
5 –	580	42	7·2	54	9·3	96	16·5
5½–	977	31	3·2	58	5·9	89	9·1
6 –	2,107	45	2·1	86	4·1	131	6·2
6½–	3,080	38	1·2	72	2·3	110	3·6
7 –	4,358	64	1·5	97	2·2	161	3·7
7½–	3,617	37	1·0	65	1·8	102	2·8
8 –	3,350	34	1·0	60	1·8	94	2·8
8½–	1,668	14	0·8	34	2·0	48	2·9
9 –	1,127	15	1·3	21	1·9	36	3·2
9½–	438	3	0·7	10	2·3	13	3·0
10 –	331	7	2·1	3	0·9	10	3·0
10½–	82	2	2·4	2	2·4	4	4·9
11 –	39	2	5·1	2	5·1	4	10·3
11½–	11	—	—	—	—	—	—
12 –	4	1	—	—	—	1	—
12½ and over	3	—	—	—	—	—	—
All Births of known Weight	22,454	514	2·3	720	3·2	1,234	5·5

up to 34 weeks, and with each half-pound increase in weight up to 4 lb. Rates are fairly constant after 39 completed weeks and above 6½ lb. The evidence for a slight increase after 45 weeks and above 11 lb. is, in the absence of adequate numbers, only suggestive.

(*d*) Trends in mortality rates by weight and by gestation are not strictly comparable, since indices of weight and duration of gestation cannot be equated.

In short, contrary to the general impression, there is little to choose between duration of gestation and birth weight as indices of the probability of survival. We shall discuss the significance of this observation in a later communication.

TABLE IV

PERIOD OF SURVIVAL RELATED TO DURATION OF GESTATION

Duration of Gestation (completed weeks)	Total Births	Percentage of Total Births Alive at:						
		Birth	One Day	One Week	One Month	Six Months	Nine Months	One Year
28	16	81·2	31·2	12·5	6·2	6·2	6·2	6·2
29	16	50·0	37·5	18·7	18·7	6·2	6·2	6·2
30	23	65·2	47·8	26·1	26·1	26·1	26·1	26·1
31	50	66·0	56·0	34·0	32·0	28·0	26·0	26·0
32	44	70·5	54·5	47·7	47·7	45·5	45·5	45·5
33	76	76·3	68·4	57·9	57·9	56·6	56·6	56·6
34	111	91·9	85·6	83·8	81·1	74·8	74·8	74·8
35	266	91·4	88·7	87·2	85·0	83·1	82·0	81·6
36	435	93·6	93·1	92·2	90·6	88·7	87·8	87·8
37	762	96·6	96·2	95·3	94·6	93·3	92·8	92·8
38	1,485	97·0	96·2	95·5	95·1	94·0	93·9	93·8
39	3,394	98·5	98·3	97·8	97·5	96·6	96·2	96·1
40	4,784	98·8	98·6	98·2	98·0	96·8	96·4	96·3
41	3,019	99·0	98·7	98·4	98·0	97·3	97·1	97·0
42	1,423	97·4	97·3	96·8	96·8	95·4	95·4	95·2
43	497	97·8	97·6	97·2	96·8	96·0	96·0	96·0
44	231	97·4	97·0	96·1	96·1	95·7	95·7	95·7
45	112	96·4	96·4	94·6	94·6	94·6	94·6	94·6
46	5	—	—	—	—	—	—	—
All Births of known Duration of Gestation and Weight	16,749	97·6	97·1	96·4	96·0	94·9	94·6	94·5
All Births of known Weight	22,454	97·7	97·1	96·5	96·1	95·0	94·6	94·5

Tables IV and V relate the period of survival to duration of gestation and birth weight respectively, and Tables VI and VII exhibit the corresponding stillbirth and neonatal death rates, deaths at between 1 and 12 months being expressed per thousand infants alive at one month. Two points should be noted: first, that the changes in association with the duration of gestation and with birth weight are more marked for the neonatal death rate than for the stillbirth rate; and second, that although the risk of death is much reduced after the end of the first month of life, it is still very definitely associated with the duration of gestation and with the weight at birth. No doubt this effect is diminished as the year progresses, but our data do not permit us to separate deaths at between 1 and 12 months.

Since weight at birth and the duration of gestation are correlated, it is of course of considerable interest to separate their effects on survival rates, and Table VIII enables us to inspect the regression of mortality rates on duration of gestation with birth weight fixed (reading down the columns) and on birth weight with length of gestation fixed (reading along the rows). We have here expressed the number of stillbirths and neonatal deaths (added together) as a percentage of total births. Unfortunately, the data do not entirely separate the effects of the two variables;

TABLE V

PERIOD OF SURVIVAL RELATED TO BIRTH WEIGHT

Birth Weight (lb.)	Total Births	Percentage of Total Births Alive at:						
		Birth	One Day	One Week	One Month	Six Months	Nine Months	One Year
1 –	4	50·0	0·0	—	—	—	—	—
1½–	19	42·1	5·3	0·0	—	—	—	—
2 –	49	53·1	36·7	10·2	8·2	6·1	6·1	6·1
2½–	60	50·0	25·0	20·0	16·7	15·0	15·0	15·0
3 –	68	63·2	50·0	39·7	36·8	35·3	33·8	33·8
3½–	89	67·4	58·4	47·2	46·1	43·8	42·7	42·7
4 –	170	81·8	75·9	71·2	68·8	64·7	63·5	62·9
4½–	223	87·4	83·9	82·1	81·2	75·8	75·3	74·9
5 –	580	92·8	90·9	88·4	86·4	84·3	83·4	83·4
5½–	977	96·8	96·0	94·3	93·3	91·4	91·0	90·9
6 –	2,107	97·9	97·3	96·7	96·0	94·3	93·8	93·8
6½–	3,080	98·8	98·5	98·0	97·6	96·8	96·6	96·5
7 –	4,358	98·5	98·2	97·9	97·6	96·6	96·4	96·3
7½–	3,617	99·0	98·8	98·7	98·3	97·5	97·3	97·2
8 –	3,350	99·0	98·9	98·6	98·5	97·6	97·2	97·2
8½–	1,668	99·2	99·0	98·9	98·6	97·8	97·4	97·1
9 –	1,127	98·7	98·5	98·2	98·0	97·2	97·0	96·8
9½–	438	99·3	99·3	99·1	98·8	98·2	97·7	97·0
10 –	331	97·9	97·9	97·6	97·3	97·0	97·0	97·0
10½–	82	97·6	97·6	97·6	97·6	96·3	96·3	95·1
11 –	39	94·9	94·9	94·9	92·3	92·3	92·3	89·7
11½–	11	100·0	100·0	100·0	100·0	100·0	100·0	100·0
12–	4	75·0	75·0	75·0	75·0	75·0	75·0	75·0
12½ and over	3	100·0	100·0	100·0	100·0	100·0	100·0	100·0
All Births of known Weight ..	22,454	97·7	97·1	96·5	96·1	95·0	94·6	94·5

for example, the weight-composition of births within any single lb. interval is undoubtedly influenced by the duration of gestation. Yet we are not able to narrow the weight interval without reducing further the number of births in each cell. In spite of these limitations the data do suggest that:

(*a*) the association between mortality and weight when gestation is constant is stronger than that between mortality and length of gestation when weight is constant,

(*b*) for births of the same weight, mortality is slightly increased when the duration of gestation is unduly prolonged,

(*c*) for births delivered after the same period of gestation, the proportion of deaths is slightly increased in the highest weight group (9 lb. and over).

SUMMARY

Data are presented which relate the mortality experienced by single births as stillbirths or deaths in the first year of life to duration of gestation (Tables II, IV, and VI) and birth weight (Tables III, V, and VII). The regression of mortality on

TABLE VI

MORTALITY RELATED TO DURATION OF GESTATION

Duration of Gestation (completed weeks)	Stillbirths (per thousand total births)	Neonatal Deaths (per thousand live births)	Deaths 1–12 months (per thousand infants alive at one month)
28–	344	810	500
30–	342	542	136
32–	258	270	31
34–	85	84	51
36–	45	24	23
38–	20	13	14
40–	12	9	14
42–	25	7	15
44–	29	15	3
All Births of known Duration of Gestation and Birth Weight	24	17	16
All Births of known Weight	23	17	16

TABLE VII

MORTALITY RELATED TO BIRTH WEIGHT

Birth Weight (lb.)	Stillbirths (per thousand total births)	Neonatal Deaths (per thousand live births)	Deaths 1–12 months (per thousand infants alive at one month)
1–	565	1,000	—
2–	486	750	143
3–	344	359	76
4–	150	108	81
5–	47	48	29
6–	16	14	17
7–	13	8	13
8–	10	5	14
9–	12	6	14
10 and over	26	7	9
All Births of known Weight	23	17	16

length of gestation when weight is fixed, and on birth weight when duration of gestation is fixed, is exhibited in Table VIII. The data require no detailed comment, but we may note the following points:

(1) There is little to choose between duration of gestation and birth weight as indices of the probability of survival.

(2) The changes in association with duration of gestation and with birth weight are more marked for the neonatal death rate than for the stillbirth rate.

TABLE VIII

PERCENTAGE OF BIRTHS STILLBORN OR DEAD IN THE FIRST MONTH OF LIFE RELATED TO DURATION OF GESTATION AT DIFFERENT BIRTH WEIGHTS

Duration of Gestation (completed weeks)	Birth Weight (lb.)									Total
	1–	2–	3–	4–	5–	6–	7–	8–	9 and over	
28–30	100·0 (3)	93·3 (30)	72·2 (18)	25·0 (4)	— —	— —	— —	— —	— —	81·8 (55)
31–34	100·0 (9)	100·0 (33)	47·6 (42)	27·5 (80)	27·7 (83)	8·8 (34)	— —	— —	— —	39·1 (281)
35–37	100·0 (2)	80·0 (5)	64·5 (31)	25·0 (100)	8·9 (303)	6·1 (479)	2·6 (380)	2·6 (114)	4·1 (49)	8·3 (1,463)
38–39	—	75·0 (4)	57·1 (14)	23·5 (68)	8·5 (412)	2·8 (1,381)	2·2 (1,810)	1·1 (900)	2·4 (290)	3·2 (4,879)
40–41	—	60·0 (5)	71·4 (7)	13·3 (30)	7·1 (294)	2·4 (1,633)	1·6 (2,978)	1·3 (2,074)	1·8 (782)	2·1 (7,803)
41–46	—	—	50·0 (2)	33·3 (6)	6·5 (77)	5·3 (436)	3·0 (787)	1·8 (622)	3·0 (338)	3·4 (2,268)
All Births of known Duration of Gestation and Birth Weight	100·0 (14)	92·2 (77)	58·8 (114)	24·3 (288)	9·5 (1,169)	3·4 (3,963)	2·0 (5,955)	1·3 (3,710)	2·3 (1,459)	4·0 (16,749)
All Births of known Weight	100·0 (23)	87·2 (109)	58·0 (157)	24·2 (393)	9·2 (1,557)	3·0 (5,187)	2·0 (7,975)	1·5 (5,018)	2·1 (2,035)	3·9 (22,454)

Numbers in brackets are the numbers of total births.

(3) Though much reduced after the end of the first month, the risk of death is still associated with the duration of gestation and with the weight at birth.

(4) The association between mortality and weight when gestation is constant is stronger than that between mortality and length of gestation when weight is constant.

(5) For births of the same weight, mortality is slightly increased when the duration of gestation is unduly prolonged; and, for births delivered after the same period of gestation, the proportion of deaths is slightly increased in the highest weight group examined (9 lb. and over).

We are greatly indebted to Dr. Jean Mackintosh and her colleagues in the City of Birmingham Maternity and Child Welfare Department for the facilities which they have placed at our disposal.

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BOOK REVIEWS

Training for Social Work: An International Survey. 1950. United Nations Publication Sales No. 1950. IV. 11. H.M.S.O., London. (15*s.*)

Prepared by the United Nations Department of Social Affairs from reports submitted by various countries, this survey describes methods of training social workers in various countries and gives details of curricula in 41 different schools. It also discusses the functions of social work and the fields of practice in which it is carried out.

C. N. SWANSTON

Methods of Social Welfare Administration. 1950. United Nations Publication Sales No. 1950. IV. 10. H.M.S.O., London. (17*s.* 6*d.*)

This survey, covering both government and voluntary agencies, has been prepared by the United Nations Department of Social Affairs from information sent in by thirty nations. Many countries have similar problems which they tackle in different ways, and in a concluding section this report indicates those countries where particular lines are being followed, so that the reader can quickly look up the information sought.

C. N. SWANSTON

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CONGENITAL PYLORIC STENOSIS
AN INVESTIGATION OF 578 CASES

BY

BRIAN MACMAHON,* R. G. RECORD, and THOMAS MCKEOWN
From the Department of Social Medicine, University of Birmingham

For investigation of certain aspects of the aetiology of the congenital malformations we require information about

(*a*) a representative collection of affected individuals,
(*b*) the population of births from which the malformed individuals are drawn.

In the case of pyloric stenosis, the collection of this information now raises no insuperable difficulty, and if knowledge (of such matters as the association of the malformation with maternal age and birth rank) is still incomplete, it is because inquiries have usually been based on hospital births for which the population of related births is unknown. In the present investigation we have attempted to overcome this difficulty by the following methods:

(1) A series of Birmingham children with pyloric stenosis has been assembled by examination of the records of all Birmingham hospitals which admit children, for the 10-year period 1940-49.† (It was, of course, necessary to exclude children whose homes were not in Birmingham.) The series can be regarded as complete in so far as

(*i*) the malformation comes to medical attention and is correctly diagnosed,
(*ii*) patients affected are sent into hospital.

(2) The related population of births is the total Birmingham births of the same period, from which we have some information from central sources. But we were also fortunate in having previously investigated a sample (every 200th birth) for comparison with malformations of the central nervous system, and it was only necessary to extend this sample to cover a further two years (1948-49).

Table I (overleaf) shows how diagnosis was confirmed in the 578 cases included in the series. In 93 per cent. the pylorus was inspected at operation or autopsy; 7 per cent. were accepted on medical evidence only (the presence of a palpable pyloric tumour). Insistence on these criteria entailed exclusion of 49 cases, shown in hospital records as " pyloric stenosis " or " pylorospasm ", in which a tumour was neither seen nor palpated.

* In receipt of a personal grant from the Medical Research Council.

† 86·5 per cent. were treated at the Birmingham Children's Hospital, and the remainder were distributed between five other hospitals.

TABLE I

METHODS OF CONFIRMATION OF DIAGNOSIS OF CONGENITAL PYLORIC STENOSIS

Diagnosis Confirmed	Number of Cases	Percentage of Total
At autopsy	42	7·3
At operation (without autopsy)	495	85·6
On medical evidence only	41	7·1
Total	578	100·0

For all 578 individuals certain observations were available in the hospital documents. Other information was elicited by field inquiry, in which one of us (B.M.) successfully traced 489 patients (85 per cent.). The interview in the home was with the mother (428), father (21), maternal grandmother (30), or a more distant relative (10).

In the present communication we rely mainly on the material obtained from hospital records, and since we make no use of the control series we postpone comment on it.

A. OBSERVATIONS FROM HOSPITAL RECORDS

(1) INCIDENCE.—Before considering evidence on the incidence of pyloric stenosis we should note that the series does not include:

(*a*) Patients diagnosed and treated at home or in a nursing home. The number is unknown but is thought to be small.

(*b*) Patients in whom the diagnosis is not established (using criteria in Table I).

Thus cases of pylorospasm and of " pyloric stenosis " (treated medically) in which no tumour was palpated are excluded. This must result in omission of a few individuals in whom the malformation is present (though unconfirmed).

It is also possible that a few Birmingham children were treated in hospitals outside the city, but on the other hand Birmingham attracts cases from the whole Midland Region, and we are satisfied that the number of Birmingham patients who seek treatment outside the city is negligible (except perhaps in the early war years when evacuation was common).

Table II gives the incidence of the condition in Birmingham for the 10 years 1940-49 as 2·98 per thousand live births. The figure, which is by no means constant from year to year, is lowest in 1941 (2·1) and highest in 1949 (4·2), and has certainly increased during the past few years. But we cannot safely conclude that the actual incidence of the condition has increased, for there were considerable movements of population during the early war years, and since 1945 improved medical services may have resulted in more complete ascertainment of cases.

Our figure for the 10-year period (2·98 per thousand live births) is not much different from the 2·8 given by Davison (1946) for Newcastle-on-Tyne from a series of 49 cases. A higher figure (4·0) obtained by Wallgren (1941) from 102

cases in Göteborg is nearer our estimate for the last few years, and it seems reasonable to give the present incidence of the diagnosed condition as about 4 per thousand live births, while reserving judgment on the secular trend.

TABLE II

INCIDENCE OF CONGENITAL PYLORIC STENOSIS

Year	Number of Cases	Related Live Births	Incidence per 1,000 Live Births
1940	51	15,882	3·2
1941	29	14,063	2·1
1942	45	17,657	2·5
1943	42	19,376	2·2
1944	51	21,720	2·3
1945	60	19,185	3·1
1946	70	22,134	3·2
1947	75	24,000	3·1
1948	72	20,530	3·5
1949	83	19,669	4·2
Total	578	194,216	2·98

(2) SEX RATIO.—Table III gives the sex ratio (per cent. male) of the 578 individuals as 81·7, and the sex incidence (per thousand related live births) as 4·73 for males and 1·12 for females. In calculating sex incidence, numbers of related live births of each sex have been obtained by applying the sex ratio of Birmingham births (taken from the Registrar-General's Statistics for 1940-1948) to the local authority's figure for the number of live births of both sexes.

There has, of course, been no serious doubt about the sex ratio in congenital pyloric stenosis. Fairly consistent figures are given, for example, by Monrad (1927), Thompson and Gaisford (1935), Akin and Forbes (1947), Nafe (1947), Schaefer and Erbes (1948), and Ward-McQuaid and Porritt (1950). Taken together, these reports include 1,061 cases of which 83·7 per cent. are males. This is in close accord with our own observation.

TABLE III

SEX INCIDENCE OF PYLORIC STENOSIS

Sex	Related Live Births	Number of Cases	Incidence per 1,000 Live Births	Relative Risk	Sex Ratio (% Male)
Male	99,875	472	4·73	4·45	81·7
Female ..	94,341	106	1·12	1·00	

Numbers of related live births were estimated for males and females by applying the sex ratio calculated from the Registrar-General's statistics for Birmingham, 1940-48, to the number of related live births (194,216).

(3) OTHER MALFORMATIONS EXHIBITED BY AFFECTED INDIVIDUALS.—A list of other malformations exhibited by 578 affected individuals is given in Table IV. It is difficult to interpret this evidence, since no child could be entered in Table IV unless it survived to the age at which pyloric stenosis is diagnosed. For example, the association of pyloric stenosis with anencephalus (which invariably results in early death) is ruled out, and its association with spina bifida and hydrocephalus (which often result in early death) is made less likely. Attention must therefore be confined to the less lethal malformations manifested at an early age whose exhibition is compatible with survival for a considerable period after birth. Unfortunately it is for such malformations that our knowledge of incidence is most sketchy.

TABLE IV
OTHER MALFORMATIONS EXHIBITED BY 578 INFANTS WITH PYLORIC STENOSIS

Other Malformations		Number of Cases	Number of Deaths
Mongolism		2	2
Congenital cataract		2	
Congenital laryngeal stridor		2	1
Congenital anal stricture		1	1
Congenital heart defect		2	
Genito-urinary deformities:	Hydronephrosis	1	1
	Dilatation of ureters	1	1
Skeletal deformities:	Bilateral talipes	1	1
	Deformity of foot	1	
	Polydactyly	1	
Head deformities:	Hydrocephalus	1	1
	Scaphocephalus	1	1
Multiple defects:	Agenesis of one kidney and Syndactyly	1	1
Total		17	10

Seventeen individuals (2·9 per cent.) exhibited other malformations, and ten of them died before the first birthday. Four others (not entered in Table IV) were mentally retarded (one a spastic with a cerebral defect), and a fifth (twin of an individual also affected by pyloric stenosis) died of a strangulated hernia. Although we have no figures for comparison, it seems justifiable to conclude that there is no striking increase in the incidence of other malformations (all types) in individuals affected by pyloric stenosis, and that there is no obvious association between pyloric stenosis and any particular malformation.

Other malformations associated with pyloric stenosis are reported by Thomson (1921), Still (1927), Rinvik (1940), Cockayne and Penrose (1943), Akin and Forbes (1947), and Grimes and others (1950). Taken together, these series include 1,124 patients of whom 30 (2·7 per cent.) had other malformations.

(4) ECONOMIC STATUS OF PARENTS.—Our only information directly related to the economic circumstances of parents is the locality of domicile. The home address of each patient was located by ward, and wards were classified in three groups whose constitution has previously been described (Record and McKeown, 1949,

Appendix A). It will suffice to state here that in general the poorest homes are in Group I, the best in Group III.

Table V compares the distribution between these groups, of homes of malformed propositi and of related live births. There is no evidence that the condition is associated with economic circumstances, although having regard to the known relation between the incidence of pyloric stenosis and parity, we must bear in mind the possible effect of differences in the parity structure of the populations of births in the three ward groups. A later communication will consider the association of incidence with birth rank, but we may state now that a correction for parity does not alter the conclusion stated above.

TABLE V

DISTRIBUTION BY WARD GROUP OF ALL CASES OF PYLORIC STENOSIS AND OF RELATED LIVE BIRTHS

Ward Group	All Propositi		Related Live Births		Difference (*a*)−(*b*)	Incidence per 1,000 Live Births
	Number	Percentage (*a*)	Number	Percentage (*b*)		
1	216	37·37	70,350	36·22	+1·15±2·00	3·07
2	241	41·70	87,243	44·92	−3·22±2·07	2·76
3	121	20·93	36,571	18·83	+2·10±1·63	3·31
Unlocated	—	—	52	0·03	—	—
All Wards	578	100·0	194,216	100·0	—	2·98

$\chi^2=2\cdot91$, $n=2$, $0\cdot2<P<0\cdot3$

In this context we may also consider briefly the question of legitimacy. Percentages of illegitimate births were as follows: for 578 malformations, 3·8 per cent. (estimated from hospital records); for 489 malformations visited at home, 3·7 per cent.; for related Birmingham live births (1940-48), 6·5 per cent. (Registrar-General). We have no reason to stress a difference of this magnitude, but certainly there is no evidence that the incidence of pyloric stenosis is higher for illegitimate than for legitimate births.

(5) SEASONAL INCIDENCE.—The observation that the incidence of anencephalus is related to the season of birth and conception (McKeown and Record, 1951) makes it of interest to examine this possibility in the case of pyloric stenosis. The necessary data are given in Table VI (overleaf), which distributes the 578 cases by month and quarter of birth. Quarterly incidence of pyloric stenosis is compared with that of related live births, and provides no evidence of seasonal variation.

B. OBSERVATIONS ON INFORMATION OBTAINED BY FIELD ENQUIRY

The observations so far discussed were available in hospital records, and are hence recorded for all 578 patients; the two remaining items of information (" maternal ill-health ", and " subsequent history ") were completed by field enquiry, and are known for only 489 individuals (born after 488 pregnancies).

TABLE VI

QUARTERLY DISTRIBUTION OF CASES OF PYLORIC STENOSIS

Months	Propositi			Related Live Births		Difference (*a*) − (*b*)
	Numbers		Percentages (*a*)	Numbers	Percentages (*b*)	
	Months	Quarters				
January	49	150	25·95	48,855	25·15	+0·80±1·81
February	44					
March	57					
April	64	149	25·78	50,496	26·00	−0·22±1·83
May	46					
June	39					
July	39	133	23·01	48,070	24·75	−1·74±1·80
August	43					
September	51					
October	46	146	25·26	46,795	24·09	+1·17±1·78
November	41					
December	59					
Total	578		100·0	194,216	100·0	—

$\chi^2 = 1 \cdot 19$, $n = 3$, $0 \cdot 7 < P < 0 \cdot 8$

TABLE VII

MAJOR CAUSES OF MATERNAL ILL-HEALTH DURING 488 PREGNANCIES

Trimester of Pregnancy	Number of Mothers Affected by					
	Toxaemia of Pregnancy	Hyperemesis	Threatened Abortion	Emotional Shock	Falls and Minor Accidents	Bacterial and Viral Disease
1	0	0	13	5	3	6
2	0	1	5	5	8	8
3	21	0	1	4	21	16
Not limited to one trimester	2	30	0	1	5	0
Total	23	31	19	15	37	30
Percent of 488 pregnancies affected	4·7	6·4	3·9	3·1	7·6	6·1

(1) MATERNAL ILL-HEALTH DURING PREGNANCY.—Table VII gives the incidence of major causes of maternal ill-health during pregnancy,* and Table VIII provides more detail for the bacterial and viral diseases grouped in Table VII. No disease appears with undue frequency; and no instance of rubella was recorded (this was the subject of a specific question). In the absence of further evidence, and of

* The diagnosis of illness in all cases rests solely on the mother's statement, and is on this account inevitably open to doubt.

TABLE VIII

BACTERIAL AND VIRAL ILLNESSES DURING PREGNANCY

Illness	Number of Mothers Affected			
	Trimester of Pregnancy			Total
	First	Second	Third	
Whooping cough	1	1		2
Influenza	2	2	8	12
Pleurisy	1			1
Pyelitis		1		1
Upper respiratory tract infection ..	2	4	8	14
Total	6	8	16	30

similar information about a control series recorded by the same observer, we attach no significance to the rather large number of falls and minor accidents reported in the third trimester. There are three other cases of interest not included in the Table: one mother attempted to procure an abortion by taking drugs, and two had positive Wassermann reactions during pregnancy.

(2) LATER HISTORY.—History of later symptoms has been recorded by field enquiry in view of reports that after treatment for pyloric stenosis vomiting occasionally persists for periods up to 3 years (Monrad, 1927), and that radiological evidence of the disease may be elicited in most cases even later (Wallgren, 1937; Runström, 1939; Andresen, 1940). In seven patients vomiting had persisted after discharge from hospital, in two of them as late as the third year. Two patients were vomiting daily at the time of the visit. No case was seen in which vomiting continued after the third birthday (although many patients had not, of course, reached this age at the time of the enquiry).

Ten patients were admitted to hospital because of gastro-enteritis, and two of them died as a result of this illness. The incidence of this condition is probably not higher than in the general population of births.

SUMMARY

An attempt has been made to collect information about every diagnosed case of pyloric stenosis born in the period 1940-49, and domiciled in Birmingham.

A. Observations based on hospital records (578 individuals).

(*i*) The incidence of diagnosed cases in Birmingham during the ten years was 2·98 per thousand live births, and during the last two years examined (1948-49) about 4 per thousand.

(*ii*) The sex ratio (per cent. male) was 81·7, and the sex incidence (per thousand related live births of the same sex) 4·73 for males, and 1·12 for females.

(*iii*) There was no evidence of increased incidence of other malformations (all types) in affected children, or of association between pyloric stenosis and any particular malformation.

Incidence was unrelated to:

(*iv*) economic circumstances of the parents (as indicated by locality of domicile)

(*v*) legitimacy of birth

(*vi*) season of birth.

B. Observations recorded by field enquiry (489 individuals).

(*i*) No history of rubella was elicited, and no other disease was reported with undue frequency in pregnancies which preceded births of children with pyloric stenosis.

(*ii*) In seven of the patients visited at home, vomiting had persisted after discharge from hospital (in two cases as late as the third year).

We are greatly indebted to the Birmingham Institute of Child Health, and to the staff of the Birmingham Children's Hospital, for permitting us to use their records. We are also grateful to the staffs of other Birmingham hospitals, in particular Dudley Road and Selly Oak, who gave access to their records.

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AGE INCIDENCE OF DYSMENORRHOEA

BY

C. R. LOWE and R. L. FERGUSON

From the Department of Social Medicine, University of Birmingham, and the Medical Department, Cadbury Bros. Ltd., Bournville

Since dysmenorrhoea refers to an ill-defined group of symptoms, it is not surprising that estimates of its incidence in women of child-bearing age range from 3 to 90 per cent. Most women experience some abdominal discomfort either immediately before or during menstruation, and the degree of discomfort called dysmenorrhoea will depend upon the individual patient's tolerance of pain, the nature of the population examined, and the investigator's criteria and interests.

If dysmenorrhoea is defined as a degree of menstrual pain sufficient to interfere with a woman's normal mode of life, estimates of incidence range from about 3 to 17 per cent. Most of these estimates are the result of questioning university students (Bell and Parsons, 1931; Cunningham, 1934), hospital patients (Emge, 1933; Bertling, 1948), hospital nurses (Larkin, 1941), or high-school girls (Goldwasser, 1938), and are by no means representative of the general female population. Several investigations have been concerned with industrial workers (Ewing, 1931; Lakeman, 1933), but no attempt appears to have been made to relate incidence to age or to marital status.

DATA

In 1927, Cadbury Brothers Ltd., Bournville, established a retiring room for women workers. This room is equipped with six camp beds, and hot-water bottles and analgesics are available under the supervision of a first-aid worker. Over the six 4-weekly periods from January 1 to June 17, 1950, a record was kept of all workers using the room who complained specifically of menstrual pain. The total works population by age and marital status for each of the months under consideration was known, and the note which follows relates this information to data from the retiring-room records.

Before proceeding, however, we must first draw attention to certain limitations of the data:

(1) Inclusion in the series depends upon each patient's decision to use the retiring room.

(2) The proportion of women who stay away from work because of dysmenorrhoea is unknown. There is reason to believe that the number is small, however, as, during the period under consideration, less than 2 per cent. of the female population had single or half-day absences from work for 3 consecutive months (the corresponding figure for male employees was about 0·2 per cent.).

(3) A few women with intermenstrual intervals of less than 4 weeks may have used the room twice within any one month, and are therefore represented twice within that month. Two visits on the same day by the same woman are counted as a single visit and the

duration of the visit is recorded as the total time spent in the retiring room during that day.

(4) Although the majority of women using the retiring room do so fairly regularly, by no means all of them report sick every month.

There are, therefore, obvious objections to using the data as a measure of the incidence

TABLE I

PERCENTAGE OF SINGLE WOMEN ATTENDING RETIRING ROOM BECAUSE OF DYSMENORRHOEA

4 weeks ending	Age Group (years)						All Ages
	15–19	20–24	25–29	30–34	35–39	40–44	
January 28 ..	6·8 (892)*	13·5 (495)	5·3 (282)	7·5 (133)	0·9 (108)	2·7 (149)	7·7 (2,059)
February 25	6·7 (859)	10·6 (499)	7·1 (281)	2·1 (145)	0·0 (120)	2·0 (152)	6·7 (2,056)
March 25 ..	6·3 (829)	11·2 (463)	6·8 (280)	2·3 (132)	0·0 (107)	0·6 (155)	6·5 (1,966)
April 22 ..	5·5 (850)	8·9 (473)	2·5 (276)	4·6 (130)	0·9 (110)	1·3 (153)	5·3 (1,992)
May 20 ..	7·0 (828)	10·6 (472)	10·8 (279)	0·8 (124)	0·0 (114)	2·0 (150)	7·2 (1,967)
June 17 ..	4·2 (826)	6·4 (470)	4·3 (276)	1·6 (129)	0·9 (111)	0·7 (149)	4·1 (1,961)

* Number of related employees in brackets.

TABLE II

PERCENTAGE OF MARRIED WOMEN ATTENDING RETIRING ROOM BECAUSE OF DYSMENORRHOEA

4 weeks ending	Age Group (years)						All Ages
	15–19	20–24	25–29	30–34	35–39	40–44	
January 28 ..	0·0 (8)*	9·6 (178)	2·9 (277)	1·5 (202)	1·3 (235)	0·5 (219)	2·9 (1,119)
February 25	0·0 (7)	6·5 (170)	3·0 (263)	2·7 (184)	1·0 (208)	0·9 (216)	2·7 (1,048)
March 25 ..	0·0 (9)	6·0 (150)	4·5 (200)	2·5 (119)	1·4 (144)	0·0 (150)	3·0 (772)
April 22 ..	0·0 (10)	3·8 (156)	3·6 (197)	4·3 (117)	0·7 (144)	2·0 (151)	2·8 (775)
May 20 ..	0·0 (8)	5·9 (152)	9·0 (211)	2·0 (153)	2·2 (180)	0·5 (190)	4·0 (894)
June 17 ..	0·0 (9)	3·0 (167)	2·0 (253)	0·0 (202)	0·4 (237)	0·0 (225)	1·0 (1,093)

* Number of related employees in brackets.

of dysmenorrhoea in the general population, but these objections are unlikely to invalidate any trend observed in relation to age or marital status.

RESULTS

Examined by age, the proportion of both single and married women using the retiring room because of dysmenorrhoea shows a fairly regular pattern at each of the six 4-weekly intervals (Tables I and II). Data collected over the 6 months are summarized in Table III (see also the Figure). The proportion of women using the retiring room is highest at 20-24 years (9·1 per cent.) and decreases with advancing age. No married woman under 20 years used the room (the population at risk was very small). It is just possible that the comparatively low incidence of single girls (6·1 per cent.) in the lowest age group may be due to an appreciable number not yet having reached the menarche, but although we have no direct information, this explanation is unlikely, as it is recognized that the mean age of the menarche is under 14 years and that more than 90 per cent. of girls have experienced their first menstrual loss by their fifteenth birthday (Engle and Shelesnyack, 1934; Hogben and others, 1948). It is more likely that this low incidence in young women supports the statement commonly made in gynaecological textbooks that the menarche may be followed by several months or

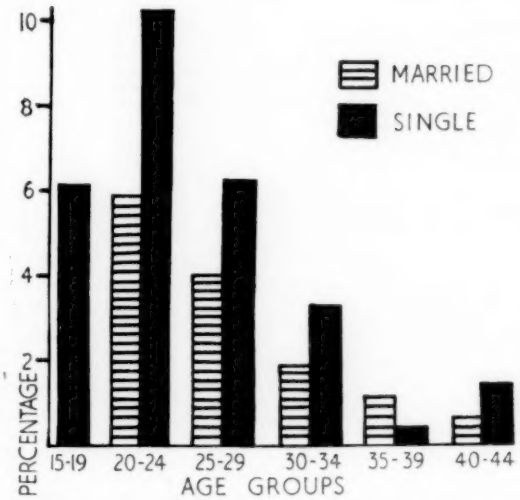

FIGURE.—Percentage of women attending retiring room because of dysmenorrhoea, by age groups.

TABLE III

MEAN MONTHLY PERCENTAGE OF WOMEN ATTENDING RETIRING ROOM BECAUSE OF DYSMENORRHOEA

Marital Status	Age Group (years)						All Ages
	15–19	20–24	25–29	30–34	35–39	40–44	
Single ..	6·1 (847)*	10·2 (479)	6·2 (279)	3·2 (132)	0·4 (112)	1·5 (151)	6·2 (2,000)
Married ..	0·0 (9)	5·9 (162)	4·0 (233)	1·9 (163)	1·1 (181)	0·6 (192)	2·7 (950)
Total ..	6·1 (856)	9·1 (641)	5·2 (512)	2·5 (295)	0·9 (303)	1·0 (343)	5·1 (2,950)

* Mean monthly number of related employees in brackets.

TABLE IV

MEAN TIME (MIN.) SPENT BY PATIENTS IN RETIRING ROOM

4 weeks ending	Age Group (years)						All Ages
	15–19	20–24	25–29	30–34	35–39	40–44	
January 28	29·0 (61)*	27·7 (84)	28·3 (23)	19·2 (13)	18·2 (4)	14·0 (5)	27·0 (190)
February 25	19·7 (58)	23·0 (64)	11·9 (28)	11·1 (8)	4·0 (2)	3·2 (5)	18·5 (165)
March 25 ..	23·6 (52)	17·1 (61)	19·4 (28)	12·5 (6)	3·0 (2)	3·0 (1)	19·3 (150)
April 22 ..	20·2 (47)	20·3 (48)	18·8 (14)	17·8 (11)	31·0 (2)	2·5 (5)	19·3 (127)
May 20 ..	26·1 (58)	22·1 (59)	21·0 (49)	2·5 (4)	2·5 (4)	2·7 (4)	21·8 (178)
June 17 ..	31·4 (35)	23·6 (35)	11·7 (17)	31·0 (2)	3·0 (2)	77·0 (1)	24·7 (92)
Monthly Mean	24·7 (52)	22·7 (59)	18·9 (26)	15·5 (7)	10·3 (3)	9·0 (3)	21·8 (150)

* Number of patients in brackets.

TABLE V

PERCENTAGE OF PATIENTS WITH DYSMENORRHOEA WHO COMPLAINED OF SEVERE BACKACHE

4 weeks ending		Age Group (years)				All Ages
		15–19	20–24	25–29	†30–44	
January 28		11·5 (61)*	16·7 (84)	13·0 (23)	22·7 (22)	15·3 (190)
February 25		5·2 (58)	17·2 (64)	17·9 (28)	26·7 (15)	13·9 (165)
March 25		3·8 (52)	8·2 (61)	10·7 (28)	44·4 (9)	9·3 (150)
April 22		8·5 (47)	14·6 (48)	7·1 (14)	22·2 (18)	12·6 (127)
May 20		5·2 (58)	5·1 (59)	20·4 (49)	25·0 (12)	10·7 (178)
June 17		8·6 (35)	14·3 (35)	29·4 (17)	0·0 (5)	14·1 (92)
Monthly Mean ..	All Patients ..	7·1 (52)	12·8 (59)	17·0 (26)	24·7 (13)	12·6 (150)
	Single Patients	7·1 (52)	12·2 (49)	18·4 (17)	23·8 (7)	11·6 (125)

* Number of patients in brackets. † Numbers do not justify subdivision of the age group 30-44.

even years of painless menstruation. The average time spent by patients in the retiring room decreases regularly and rapidly with advancing age (Table IV). This suggests that, although the incidence of dysmenorrhoea under 20 years of age is low, it is likely to be more severe then than at any later age.

With the exception of the age group 35-39 years, in which the numbers are very small, a higher proportion of single than married women use the retiring room at all ages. It is evident that marriage (and possibly parity) has an appreciable effect in diminishing the severity of menstrual pain, but the marked decrease in incidence with advancing age is not fully explained either by marital status or parity, since single women show a similar age trend. Table V shows that the proportion of women using the retiring room who complain of severe backache during menstruation increases rapidly with age and that this also bears little relation to marital status.

We have pleasure in acknowledging our thanks to the staff of the retiring room for their co-operation, and to Miss M. Flear of Cadbury's Statistical Department for help in tabulating the data.

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ABSTRACTS

(This section of the JOURNAL *is devoted to selected abstracts of articles on social medicine appearing in the current literature. It is published in collaboration with the two abstracting Journals,* ABSTRACTS OF WORLD MEDICINE, *and* ABSTRACTS OF SURGERY, OBSTETRICS, AND GYNAECOLOGY.)

A Medical Survey in a Gold Coast Village. COLBOURNE, M. J., EDINGTON, G. M., and HUGHES, M. H. (1950). *Trans. roy. Soc. trop. Med. Hyg.*, **44**, 271. 1 fig., 16 refs.

This is a painstaking, accurate, and complete corroboration of the generally accepted statement that it is normal for Africans to harbour several different parasites, to be relatively undernourished, and to be anaemic.

The village chosen contained 225 inhabitants and was more healthily situated than many; there was no serious poverty, though most of the tenants were in debt to the African landlord. The average height, weight, and blood count was below the standard for Great Britain, and the erythrocyte sedimentation rate was consistently above normal. The spleen rate was 45·5 per cent. and the incidence of worm infestation varied from 9·1 per cent. for *Schistosoma haematobium* to 75 per cent. for *Ascaris lumbricoides*. Hepatomegaly was noted in about one-third and attributed partly to malnutrition, for protein lack seemed evident. About 75 per cent. had signs of active or quiescent yaws, and figures are given of the incidence of other diseases.

[The whole picture shows how far the application of scientific knowledge lags behind its acquisition and is a challenge, especially, to educated Africans.]

Clement Chesterman

The Incidence and Prevention of Tetanus among Civilians. CONYBEARE, E. T., and LOGAN, W. P. D. (1951). *Brit. med. J.*, **1**, 504. 2 figs, 8 refs.

The male death rates from tetanus during 1940 to 1948 were about half those recorded between 1931 and 1940, while the female rates declined very slightly. During the period 1928 to 1947, in each sex the mortality was highest during infancy and childhood, lowest during middle life, rising again after 30, especially among males, in whom the mortality rates at all ages were much higher than those in the female. In infants, the majority of deaths occurred under the age of one month, males again predominating. The highest rates in England and Wales occurred consistently in the East and South-west regions, probably due to the high rural population in these areas. Wartime experience has clearly shown the efficiency and safety of active immunization against tetanus. The impracticability of similar active immunization of the civilian population is realized, but it is suggested that immunization of children at the age of entry to school, especially in rural districts, is both feasible and desirable. *J. L. Markson*

Poliomyelitis. Hospital Enquiry, 1949. Part II. BRADLEY, W. H., and GALE, A. H. (1950). *Mon. Bull. Min. Hlth*, **9**, 242. 2 refs.

In this second part of their report on the Ministry of Health's hospital inquiry into the incidence of poliomyelitis during 1949, the authors summarize the information obtained concerning the effect of pregnancy, tonsillectomy, and cross-infection in hospital, on the spread of the disease.

The case fatality among pregnant women suffering from poliomyelitis (69 cases) was 20·3 per cent., while that among women of child-bearing age who were not pregnant (668 cases) was 19·8 per cent. It is thus concluded that pregnancy does not increase the fatality of poliomyelitis.

Only sixteen cases were reported in which tonsillectomy had been performed within 2 months of the onset of the disease, this small number being attributed to the reduction in the number of such operations performed during the epidemic. While this group of cases is too small for statistical purposes, it is of interest to note that bulbar paralysis occurred in eight out of the sixteen.

Details are given of twelve cases in which it was at least possible that the infection was incurred through contact with another case in a hospital ward. The authors state that such cross-infection appeared to be less frequent in hospitals for infectious diseases and they suggest that until more is known of the mode of transmission it is not advisable to admit into a general ward any patient who may be incubating poliomyelitis. *Joseph Ellison*

Poliomyelitis in London in 1949. BREEN, G. E., and BENJAMIN, B. (1950). *Brit. med. J.*, **2**, 1473. 1 fig., 3 refs.

An account, supported by a spot map and tables, is given of the outbreak of poliomyelitis in the Administrative County of London during 1949, and some comparisons are made with the 1947 outbreak, as reported by Daley.

The similarities noted are: (1) A sample of hospital admissions indicates that the percentage of paralytic cases was approximately the same in 1947, 62 per cent. of confirmed diagnosis being paralytic and 46 per cent. having residual paralysis. The case fatality was 7 per cent., compared with 5 per cent. in 1947. (2) The sex ratio was not significantly altered.

Striking dissimilarities were a markedly disproportionate involvement of the London Boroughs north of

the Thames. In 1947 the spot map gave a general impression of wide scatter, no area escaping. In 1949 it was indeed remarkable that there were wide areas, for example in Deptford and Greenwich, without recorded cases. The slower epidemic rise in 1949 made it possible to discern directions of spread, of which there may have been two main streams: (*a*) from Hampstead, in the north-west, southwards and eastwards, the eastward branch finally turning south to take in a limited area in Deptford and Greenwich; (*b*) from Lewisham, in the south-east, in a north-westward and westward direction.

The most striking observation is the fall in age incidence. Whereas in 1947 only 27·9 per cent. of the cases occurred in children under the age of 5, in 1949 the age distribution of cases resembled that seen before 1946, and 53·3 per cent. were in children under 5. When the differences between the actual incidence by age groups and the distribution expected on the basis of the 1947 figures is considered, it is found that the largest differences occur in the age group 1 to 2, and the next largest in the group 2 to 4 years. It is suggested that this may perhaps have been due to the earlier outbreak in 1947 raising herd immunity. Unfortunately for this theory the relationship between a high incidence in 1947 in a locality and a lowering of the average age incidence in the same locality during 1949 is not a simple one. This difficulty is discussed.

The 1949 outbreak showed a more leisurely development both in time and in space than the 1947 epidemic.

W. H. Bradley

Tuberculosis in Student Nurses and Medical Students at the University of Wisconsin. DICKIE, H. A. (1950). *Ann. intern. Med.*, **33,** 941. 1 fig., 11 refs.

Since 1933 the Student Health Service of the University of Wisconsin has been investigating the incidence of tuberculosis among medical students and student nurses. Nearly all students were tested on entering the schools, first with 1 unit of tuberculin and then, if negative, with 100 units. Students who gave negative reactions were retested at 6-monthly intervals. Radiographs were taken on admission and on graduation, and also every 6 months in the case of reactors. After October, 1942, B.C.G. vaccination was made available to those whose reaction was negative. The multiple puncture technique was used on 245 medical students and 174 student nurses; all but two gave a positive reaction. There were no systemic reactions, local abscesses, or regional adenitis. Tuberculin sensitivity on entry varied for nurses from 8 to 42 per cent. and for students from 22 to 43 per cent. The percentage of students who gave negative reactions on entry and positive during training varied from 14 to 42; there was no decline in the conversion rate in the period before the use of B.C.G.

The authors have studied the tuberculous morbidity in these different groups. They rightly stress that morbidity among those tuberculin-negative should be considered especially in respect of those who converted to positive. [There is some confusion in the statistics, for the proportion of conversions given in the analysis at this point is greater than that given earlier.] Of 33 nurses who gave positive reactions on entry, one developed tuberculosis; of 89 nurses who were negative on entry, 59 converted to positive, and of these eight developed tuberculosis.

Among medical students entering from 1934 to 1943, 95 were positive on entry, and tuberculous lesions developed in two of these; 188 were negative on entry, 138 converted to positive, and of these nineteen developed tuberculosis. Among medical students entering from 1944 to 1947, 46 were positive on entry and two developed tuberculosis; 106 were negative and received B.C.G. vaccine and of these one developed a tuberculous lesion; 44 were negative and were not vaccinated, 34 converting to positive, among whom tuberculosis developed in six. The results add strong support to the thesis that B.C.G. vaccination undoubtedly reduces the morbidity closely following primary tuberculous infection. *M. Daniels*

Mediterranean Anemia in Children of Non-Mediterranean Ancestry. SILVER, H. K. (1950). *Amer. J. Dis. Child.*, **80,** 767.

The anaemia described by Cooley and Lee in 1925 occurred in natives of the Mediterranean area, and was characterized by progressive pallor, splenomegaly, and a mongoloid facies. The disease had a familial incidence, the anaemia was microcytic and hypochromic, target cells were present, the erythrocytes showed an increased resistance to hypotonic salt solutions, and characteristic bone changes were found in the radiograph.

Since these cases were described, the syndrome has been recognized in patients of non-Mediterranean stock, and reports of cases showing minor manifestations of the syndrome have appeared. In this paper the clinical features in ten patients from four non-Mediterranean families are recorded. In most of the patients the disease was of the mild type, and radiological changes in the bones were present in only one case. The diagnosis was established by haematological examination, anaemia of the hypochromic microcytic type, target cells, and decreased erythrocyte fragility being found.

Symptomatic treatment was given with blood transfusions and administration of iron by mouth.

R. M. Todd

Malaria Eradication Scheme, Mauritius. DOWLING, M. A. C. (1951). *Nature, Lond.*, **167,** 67.

In 1949 an attempt was made to eradicate malaria in Mauritius, which has an area of 720 sq. m. (1,865 sq. km.) and a population of 450,000, by spraying the insides of buildings that harboured two malaria-carrying mosquitoes, *Anopheles funestus* and *A. gambiae*. The former breeds all the year round, the latter only in the hot season, January to May. The buildings (total 79,829) were sprayed with preparations of DDT and BHC, first from January to May and again from August to December. This was followed by a striking reduction in the incidence of malaria, the annual death rate, the infant mortality rate, and the number of mosquitoes. The mean annual death rate per 1,000 population for 1934-48 was $27{\cdot}2 \pm 3{\cdot}37$, that for 1949 was 16·6; the infant mortality rate for 1934-48 per 1,000 live births was $150 \pm 19{\cdot}2$, that for 1949 was 91. The percentage reduction in the number of mosquitoes caught in dwellings was: *A. gambiae* 97·12, *A. funestus* 99·85, and *Aedes aegypti* 99·94. The death rate from malaria during the epidemic first 6 months of the year was also much lower

after the spraying; the mean rate per 10,000 population for 1934-48 was $32{\cdot}2 \pm 8{\cdot}07$; for 1949 it was 12·9, and for 1950 it was 4·9. Among 6,445 children born after the first spraying, only fifteen (0·23 per cent.) had malarial parasites in the blood. *A. gambiae* bred profusely after the heavy rains of March and April, 1950, and as the malaria incidence continued to fall, it was believed that this mosquito, repelled by the insecticide on the walls, had altered its feeding habits and had found outside resting places. This view was strongly supported by experimental observation and the question is to be further investigated. *J. F. Corson*

DDT as a Residual Insecticide against *A. letifer* and *A. maculatus* in Malaya. NAIR, C. P. (1951). *Nature, Lond.*, **167,** 74. 13 refs.

In a previous experiment made in the same hyper-endemic malarious village in Malaya, the inside and the outside of the walls of all the houses were sprayed with 5 per cent. DDT solution in kerosene, at the rate of 100 mg. per sq. ft. (929 sq. cm.), three times in 4 months [March to June, 1946]. Practically no mosquitoes, *Anopheles letifer* being the chief vector, were caught for 2 to 4 weeks after each spraying. In the author's experiment an empty block of houses was similarly sprayed once only, and two people slept in each house for 14 days from the day of spraying; no mosquitoes were found among the dead insects collected daily in the houses. As kerosene repels mosquitoes for a few days only, any repellent effect was due to DDT, and the author believes that the mosquitoes which entered were irritated by the DDT on the inside walls and escaped. *A. letifer* is an "outdoor rester" and will also feed outside the houses. Another important malaria vector in Malaya is *A. maculatus* which is also an outdoor rester though not an outdoor feeder. It was repelled to some extent when DDT was sprayed on outside walls only. The author considers that DDT can control *A. letifer* and malaria carried by it, and that it should be even more effective against *A. maculatus*. *J. F. Corson*

Familial Types of Thyrotoxicosis and their Relation to Tuberculosis. (États basedowiens de caractère familial et tuberculose.) DELORE, P., and NOEL, G. (1951). *Pr. méd.*, **59,** 245.

Earlier observations indicated a relation between tuberculosis and familial thyrotoxicosis. The present authors report ten further cases of thyrotoxicosis, in all of which another member of the family showed thyroid dysfunction, and in six of which there was a family history of tuberculosis. They consider that thyroid disease is often the result of a tuberculous lesion, and that a systematic search would reveal tuberculosis in the families of two-thirds of thyrotoxic patients.
Nancy Gough

Endemic Goitre in North-east Switzerland. Results of 27 Years' Prophylaxis with Iodized Salt. (Die Kropfendemie in der Nordostschweiz. Ergebnisse einer 27 jährigen Jodsalzprophylaxe.) RICHARD, M. (1951). *Praxis*, **40,** 1. 4 figs, 11 refs.

This article records the striking effect of iodized salt on the incidence of goitre in the various cantons of Switzerland. The incidence of goitre among children in 1922 was as high as 65 per cent. in some parts, and where prophylaxis has been carefully carried out this has fallen to below 5 per cent. There still appears to be a deficit of 100 μg. out of the daily need of 200 μg. in the iodine intake of many of the population, but, despite this, goitre is becoming less common. Army discharges due to goitre have fallen from 64 per cent. in the period 1900-5 to 0·7 per cent. in 1944-47. Iodine lack is not the only factor in the production of goitre and vitamin A is important in this connexion. The post-operative relapse rate of goitre is reduced by the administration of iodine to all patients operated on for goitre, but it is not entirely abolished; it is possible that lack of vitamin A is responsible for these relapses. In the future it is hoped that the iodine content of salt will be increased to give an adequate daily iodine intake, and that animal manure will replace chemical fertilizers, because the former has been shown to increase the vitamin-A content of fodder and vegetables.
G. S. Crockett

Mortality from Circulatory Diseases in Norway 1940-1945. STRØM, A., and ADELSTEN JENSEN, R. (1951). *Lancet*, **1,** 126. 4 figs, 3 refs.

Until the outbreak of war in 1940 there had been a rising mortality from diseases of the circulation in Norway. During the war there was a decline, with a quick return to former levels after the war. These trends were analysed for different age groups, different syndromes (apoplexy, arteriosclerosis, chronic nephritis, and chronic myocarditis) and for urban and rural populations. Bearing in mind the changing fashions of diagnosis, the authors nevertheless consider that there is evidence of a correlation between the incidence of circulatory disease and the composition of the diet, especially in respect of fats. Although the over-all decline was the same in rural as in urban districts, analysis of the mortality from the various syndromes showed that the decline was much less in rural districts in respect of arteriosclerosis, and chronic myocarditis—the conditions which might be expected to be most affected by a reduction in fat intake, which was naturally more marked in the towns. *Scott Thomson*

Heredity and Leg Ulcers. ANNING, S. T. (1950). *Brit. med. J.*, **2,** 1305. 3 figs, 30 refs.

In this paper the author first reviews the literature on the subject and then he presents his findings in a series of 525 cases seen at Leeds General Infirmary. These cases were first divided into thrombotic and non-thrombotic groups. The series was then further sub-divided into different aetiological groups. In the thrombotic series of cases there was a positive family history in 25 per cent. It is pointed out that hereditary factors may have played some part in causing the thrombosis, so that this figure does not represent that to be found in the general population. In the thrombotic group 53·4 per cent. of the patients with ulcers caused by post-partum thrombosis gave a positive family history. It is noted that the mothers of ten of the patients and the sisters of two of these ten had also suffered from post-partum thrombosis. It is pointed out that special precautions seem to be indicated in parturient women with a family history of varicose veins, leg ulcer, or thrombosis, especially if the confinement is difficult.

Among the other patients in the thrombotic group, those with ante-partum thrombosis and thrombosis due to treatment of varicose veins, operation on the leg, and to unknown causes had a higher incidence of positive family histories than was expected. In " silent " thrombosis and thrombosis from recumbency heredity seems to play a doubtful part.

In the non-thrombotic groups heredity is clearly of importance in ulcers due to varicose veins alone. A positive family history was present in 89·9 per cent.

The number of patients with primary arteriosclerotic ulcers was small, but of these a large proportion gave a family history of leg ulcers without varicose veins. It is notable that, apart from the arteriosclerotic group, the proportion of patients with a family history of ulcers only was small compared with that of patients with a family history of varicose veins. Primary varicose veins seem to be the common factor in the family history, when positive, of most patients with leg ulcers of the post-thrombotic and the varicose types. *H. S. Laird*

Studies of the Inheritance of Diabetes Mellitus. I. The Relation of Heredity and the Age of Onset of Diabetes. THOMPSON, M. W., LAAKSO, L. E., and WATSON, E. M. (1950). *Canad. med. Ass. J.*, **63**, 556. 3 figs, 7 refs.

Family histories were obtained of 1,380 patients with diabetes mellitus in Ontario through personal interviews, from hospital records, and by questionnaire. A " positive family history " of diabetes was found in 50 per cent. of females and 51 per cent. of males. The percentage decreased steadily with increasing age of onset in males, from 70 per cent. when onset was in the first decade to 30 per cent. in the 8th decade. The trend in females was similar except for an unusually low proportion of positive family histories where onset was in the 2nd decade. Where the positive family history was bilateral the mean age of onset was 33·1, where unilateral 47·3, and where negative 53·8 years.

The authors conclude that diabetes mellitus behaves genetically as a graded character and that their findings conflict with the view that juvenile diabetics are homozygous and older diabetics heterozygous for a gene predisposing to diabetes.

[No definition of the term " positive family history " is given. It is not possible to read from the graphs shown the numbers on which the percentages quoted are based, since men and women are not shown separately on the graph of distribution of patients by age of onset. The bearing of this investigation on the genetics of diabetes is so indirect and so many qualifying factors are present that only tentative conclusions may be drawn.] *C. O. Carter*

The Occurrence in a Family of Sicilian Ancestry of the Traits for Both Sickling and Thalassemia. POWELL, W. N., RODARTE, J. G., and NEEL, J. V. (1950). *Blood*, **5**, 887. 3 figs, 36 refs.

Examination of a Sicilian family over three generations showed the presence of the sickling phenomenon in the father and a gene for thalassaemia in the mother. A 38-year-old son was found to have a chronic haemolytic anaemia of the sickle-cell type as well as evidence of thalassaemia. His two sons were also found to have thalassaemia minor, while his brother and two nephews showed the sickling trait. Three possible hypotheses are discussed to account for the severity of the anaemia in the 38-year-old patient; the authors suggest that many of the reported cases of sickle-cell disease in Caucasians may actually involve a genetic situation comparable to the one reported here. *John F. Wilkinson*

Hemolytic Anemia Secondary to a Familial (Hereditary) Defect in Hemoglobin Synthesis. Report of a Case with Radioiron Studies. MILLS, H., HUFF, R. L., KRUPP, M. A., and GARCIA, J. F. (1950). *Arch. intern. Med.*, **86**, 711. 4 figs, 23 refs.

The importance of genetic factors in certain anaemias is reviewed and the authors postulate the existence of a type of haemolytic anaemia secondary to a hereditary defect in the synthesis of haemoglobin. In support of their hypothesis they present the case history of a white male patient who manifested a normocytic anaemia on repeated blood examinations over 14 years. A comprehensive study of the patient's blood picture and bone-marrow smear showed stippled cells and " inclusion bodies ". Chemical and serological studies of blood revealed no abnormality. Blood volume was normal but plasma iron levels were unusually high at 2·0 to 2·2 μg. per ml. (normal = 1·4 μg.). The rate of plasma iron turnover was, moreover, shown to be about double that in the control group of normal subjects. The erythrocytic life, computed from red cell iron turnover, was only 45 days in their patient compared with the normal of 95 days. Treatment with iron orally and intramuscularly, liver intramuscularly and intravenously, folic acid, vitamin B_{12}, and massive doses of vitamins had no affect upon the anaemia.

The patient's history revealed that his father had a refractory anaemia, and his sister and his daughter were both anaemic. This history, together with the similarity of the patient's blood picture (cell inclusions) to that in other cases of known hereditary origin, the absence of antibodies of acquired haemolytic anaemia, and the lack of symptoms suggesting the genetic nature of this case. The defect is probably the defective passage of iron between the cytoplasm and nucleus which renders the synthesis of haemoglobin faulty. In this way stippled cells are formed and these are more fragile than normal cells.

Experimental observations on iron turnover in the nuclei and cytoplasm of rabbit bone-marrow cells support the theory of this defect. No treatment is suggested for anaemias of this type. *H. Payling Wright*

Polycystic Disease of the Kidneys and Spina Bifida in One Family. (Familiair voorkomen van cystenieren en spina bifida.) KEIZER, D. P. R., and LAAN, H. A. (1950). *Ned. Tijdschr. Geneesk.*, **94**, 2741. 5 refs.

The authors describe a family of seven siblings, three of whom died in the first day of life from bilateral renal tumours. Necropsy in one of these showed a cystic renal malformation belonging to a late stage of renal development. Pyelography in the other members of the family revealed nothing abnormal in the kidneys, but showed that the mother and her four other children had a spina bifida in the region of L5 and S1. The possible relation between these two findings is discussed.

A. Middelhoven (*Excerpta Medica*)

A Study of the Occurrence of Normal Rh-Negative Infants Born to Sensitized Rh-Negative Women. LUCIA, S. P., and HUNT, M. L. (1950). *J. Pediat.*, **37**, 599. 10 refs.

The authors have studied from amongst 250 cases of Rh sensitization investigated at the University of California Medical School, thirty in which normal Rh-negative infants were born. Tables are given indicating the results of the serological tests and details of previous children. The cases fall into two groups: (1) in which the Rh antibody was present in every examination, and (2) in which it was present in some examinations, but not in all. The first group was further divided into those cases in which the titre of antibody rose by at least two dilutions, and those in which it remained constant. In those showing an increase in titre, appreciable amounts of antibody were found in all cases, both in saline and albumin. In those with a constant titre, seven out of ten showed an appreciable amount of antibody and in six out of eight this was present in saline and albumin. In the second group of cases titres were low in all, but were present in saline and albumin in seven out of thirteen cases.

The authors attribute the rising titres to an "anamnestic" reaction occurring during pregnancy, and the constant titres as being due to carry-over from a previous sensitization. In the latter group, however, they found greater ABO incompatibility between mother and child than might have been expected, and the failure of the titre to rise might be due, in their opinion, to competition of antigens. *H. G. Farquhar*

Erythroblastosis Fetalis. IV. Further Observations on Kernicterus. VAUGHAN, V. C., ALLEN, F. H., and DIAMOND, L. K. (1950). *Pediatrics*, **6**, 706. 21 refs.

The incidence of kernicterus was studied in all the infants with erythroblastosis foetalis born alive at the Boston Lying-in Hospital from 1945 to 1948, or admitted to the Children's Hospital, Boston, in 1947 to 1948. The frequency of kernicterus in the infants born alive was 12 per cent., and 5 per cent. in those infants surviving the first week of life. The greater the intensity of maternal sensitization the more likely is kernicterus to develop. The authors consider kernicterus to be a disease of neonatal life, more likely to occur when the period of gestation has been less than 38 weeks, so that immaturity more or less cancels any gain obtained by induction of labour. There would appear to be a familial tendency to kernicterus, as with a past history of a previously affected infant, the chances increase of this complication reappearing in a subsequent live-born Rh-positive infant. *W. G. Wyllie*

Studies of the Influence of Sex of Donor on the Survival of Erythroblastotic Infants Treated by Exchange Transfusion. SACKS, M. S., SPURLING, C. L., BROSS, I. D. J., and JAHN, E. F. (1950). *Pediatrics*, **6**, 772. 3 refs.

In view of suggestions that transfusion of female blood, rather than male, improved the chances of survival of infants with erythroblastosis, the authors present an analysis of 55 cases, of which 23 received blood from female donors and 32 from male donors. The over-all mortality was 17·6 per cent., and no advantage was observed from the use of female as compared with male blood in exchange transfusions, even in cases of a severe type. *W. G. Wyllie*

Spherocytosis and Increased Fragility Occurring in Erythroblastosis Fetalis Associated with ABO Incompatibility. ROBINSON, G. C., PHILLIPS, R. M., and PRYSTOWSKY, M. (1951). *Pediatrics*, **7**, 164. 14 refs.

Four cases of hemolytic disease of the newborn infant are reported. There was ABO incompatibility and high maternal immune antibody after delivery. Immune antibody was demonstrated in the sera of three of the four infants. The difficulties in making an unequivocal diagnosis are discussed and the diagnostic value of immune antibody in the infant's serum is emphasized. The presence of spherocytosis and altered erythrocyte hypotonic fragility during the hemolytic phase is noted. These findings are similar to cases of acute hemolytic anaemia in adults previously reported.—[*Authors' summary.*]

The Female Carrier of Haemophilia. A Clinical and Laboratory Study. MERSKEY, C., and MACFARLANE, R. G. (1951). *Lancet*, **1**, 487. 4 figs, 9 refs.

Known and suspected carriers of haemophilia were compared with normal female controls in respect of: (1) history of abnormal bleeding; (2) coagulation time as estimated by Bürker's and Lee and White's methods; (3) prothrombin consumption on clotting; (4) titration of anti-haemophilic factor in whole blood. It was found that 5 per cent. of normals, 47 per cent. of known carriers, and 17 per cent. of mothers of one haemophilic son, bled excessively after tooth extraction (out of 100 normal persons and nineteen known and twelve suspected carriers). The coagulation times and antihaemophilic-factor content of the blood showed no differences between the groups. Of 21 known carriers, three showed abnormal prothrombin consumption on clotting; these three bled excessively after tooth extraction. The results were too inconstant to be of diagnostic value. *G. Discombe*

The Differential Diagnosis of Haemophilia on Biological Grounds. (Diagnostic biologique différentiel des hémophilies.) GUILLOT, M., and FIEHRER, A. (1951). *Sang*, **22**, 114. 5 figs.

The authors briefly discuss true haemophilia and its differential diagnosis. A valuable table is presented for the distinction of true haemophilia, para-haemophilia, and the pseudo-haemophilia of Castex and Pavlovsky. *A. Piney*

Vitamin K in the Prevention of Haemorrhagic Disease of the Newborn. HAY, J. D., HUDSON, F. P., and RODGERS, T. S. (1951). *Lancet*, **1**, 423. 14 refs.

The hypoprothrombinaemia occurring normally in the first few days of life may be prevented by the administration of vitamin K. The present paper records an investigation, carried out at the five largest maternity units in Liverpool, of the effect of routine administration of vitamin-K analogue to mother during labour. The 4,602 children of treated mothers were compared with

12,136 children whose mothers had received no vitamin K. Haemorrhagic disease of the newborn occurred in eleven of the test infants (1 in 418 cases) and in 23 of the controls (1 in 527 cases).

It is concluded that vitamin K does not always succeed in preventing haemorrhagic disease of the newborn and that its routine use in maternity units is not justified except possibly in cases where there is an increased risk of neonatal bleeding. *J. A. Chalmers*

Seasonal Incidence of Congenital Malformations of the Central Nervous System. McKeown, T., and Record, R. G. (1951). *Lancet*, **1,** 192. 3 figs, 10 refs.

The seasonal incidence of congenital malformations of the central nervous system has been investigated, two sources of information being employed: (1) the annual reports of the Registrar-General for Scotland which have given the certified causes of stillbirths month by month since 1939, and (2) special observations made on 930 consecutive children with such malformations born in Birmingham in 1940-47. The former data revealed a seasonal trend in anencephalus, but not in other defects. The monthly rate of stillbirths attributed to anencephalus rose progressively from June to reach a maximum in the months of November to February and then fell off. For the 8 years 1939-46, the rate for the half-years April to September was 2·20 per 1,000 total births, and for October to March 2·83 per 1,000, a difference which is unlikely to be due to chance. The Birmingham data also revealed no significant seasonal variation in the incidence of spina bifida and hydrocephalus, but a substantial difference in the half-yearly rates of incidence of anencephalus—1·94 per 1,000 total births in the second and third quarters combined, and 2·70 per 1,000 in the fourth and first. In those cases where information on the length of gestation was available, the proportion conceived during the half-year from April to September was substantially greater for the children with anencephalus than for normal children. This seasonal variation cannot be simply explained in terms of seasonal changes in the relative proportions of first and of later births. No history of a specific fever during pregnancy was obtained from the mothers of the malformed children. The number of cases of malformation of the system among 470 sibs born after the birth of a child with such a malformation was thirteen as against an expected number of approximately two. *A. Bradford Hill*

Incidence of Foetal Malformations in 1945-49. (Häufigkeit der Missgeburten in den Nachkriegsjahren 1945-1949.) Nowak, J. (1950). *Zbl. Gynäk.*, **72,** 1313. 1 fig., bibl.

In this discussion of the incidence of foetal malformations, material from the Municipal Clinic for Women, Chemnitz, from the years 1945 to 1949, is compared with material collected during the years 1931 to 1933, 1934 to 1935, and 1937 to 1938, the same number of deliveries (5,346) being involved.

A definite increase in the incidence of malformations after the war was noted. The average figure for the years 1945 to 1949 is 2·4 per cent. as against 1·15 per cent. during 1931 to 1933, 0·34 per cent. in 1934 to 1935, and 0·26 per cent. in 1937 to 1938. The increase in malformations of the central nervous system is definite. The following groups were distinguished: central nervous system 42·4 per cent., limbs 28·7 per cent., cleft formations of the face 10·7 per cent., others 18·2 per cent.

A subdivision of mothers into four age-groups shows that the groups with the greatest reproductive capacity are associated with the highest incidence of foetal malformations, and in this group particularly the primiparae and secundiparae. The author concludes that malnutrition (especially protein deficiency) and psychological difficulties may well have some effect on the incidence of foetal malformations. *Albert Eichner*

Congenital Malformations and External Factors. (Missbildungen und Umweltfaktoren.) Aresin, N., and Sommer, K. H. (1950). *Zbl. Gynak.*, **72,** 1329. 10 figs, 7 refs.

In the University Clinic for Women, Leipzig, the incidence of malformation in newborn babies was investigated during the years 1936 to 1948 (43,647 infants). Among the 399 cases of malformation (0·91 per cent. of all cases) an increase in incidence of malformation of the central nervous system was noted. Since 1945 a decrease in incidence of malformations has been observed. An explanation for this might be found in nutrition, the ages of the mothers, or infectious diseases. In accordance with the experiments of Gillman and others (1948), an alteration of the albumin-globulin ratio in favour of the globulin fraction is regarded as the cause. The above-named external factors do indeed cause a disturbance of the albumin-globulin quotient. The influence of external factors on the development of the malformations is stressed. *Albert Eichner*

Dysostosis Multiplex (Gargoylism) with Maldevelopment of the Membrane of Bowman. (Beitrag zur Frage der Dysostosis multiplex (Pfaundler-Hurler) mit Fehlbildung der Bowmanschen Membran.) Wagner, F. (1951). *Z. Kinderheilk.*, **69,** 179. 10 figs, 26 refs.

The author describes in detail a case of gargoylism in a boy, and reviews the literature of this rare disease. When the patient first came under observation at the age of 3 months, few of the characteristic symptoms had developed, and the bone changes then found might well have been rachitic. Later all the usual symptoms developed, until, at the age of about one year, the child showed the full picture of gargoylism, including corneal opacities. Rise in intra-ocular pressure was found on only one occasion. The child died at the age of 2 years after a herniotomy, and necropsy confirmed the clinical findings. Histologically there was an almost complete absence of the membrane of Bowman.
Marianna Clark

Spina Bifida and Hydrocephalus (Arnold-Chiari Syndrome). (Spina bifida et hydrocéphalie (Le syndrome d'Arnold Chiari).) Pasquié, M. (1951). *Pr. méd.*, **59,** 50. Bibl.

The relation between spina bifida and hydrocephalus has not yet been fully clarified. The author reports four fatal cases of spina bifida with meningomyelocele accompanied by hydrocephalus; three of the patients died soon after operation for repair of the meningomyelocele and the fourth of an intercurrent illness. In three of these cases the Arnold-Chiari malformation was

found at necropsy. Reviewing the literature, the author accepts the view that the Arnold-Chiari malformation is secondary to fixation of the spinal cord in the lumbar region during foetal development, and that the cerebral lesions are secondary to the resulting hydrocephalus. The argument is rejected that closure of the meningomyelocele necessarily increases the degree of hydrocephalus; on the contrary, this procedure is advocated as the treatment of choice, to be carried out, accompanied by decompression of the atlanto-occipital region, during the first few days of life. *H. McC. Giles*

Congenital Esophageal Anomalies. Review of Twenty-four Cases and Report of Three. BROWN, R. K., and BROWN, E. C. (1950). *Surg. Gynec. Obstet.*, **91,** 545. 8 figs, 11 refs.

The authors review 24 cases of oesophageal anomaly (21 of atresia, three of stenosis) seen at the Buffalo Children's Hospital during the 10-year period 1940-49. The most common type of congenital oesophageal atresia (fourteen out of 21 cases in the present series) consists of a blind upper pouch and a lower segment which connects the stomach to the trachea. Untreated, this may cause death in any of three ways: by starvation, by regurgitation of gastric contents into the trachea, and by the aspiration of pharyngeal mucus. The most frequent diagnostic error in this type of case in the present series were bronchopneumonia and intracranial birth injury. Other congenital anomalies occurred in eight of the fourteen cases, in two of which there was an imperforate anus. It is stated that " marked abdominal distension during the first two days after birth is apparently not due to imperforate anus alone but is apt to occur when there is an associated tracheo-esophageal fistula ". The fact that nine of their 24 cases occurred during a period of a few months suggests to the authors that oesophageal anomaly may be environmental rather than hereditary in origin.

Eight of the patients were operated upon. In one case gastrostomy alone was performed, and the patient died at operation; in three a transpleural operation was performed, all the patients dying post-operatively; and of four infants in whom an extrapleural anastomosis was carried out, two died post-operatively, one lived for 21 months, and one survived. The case histories of three of these cases operated upon by one of the authors are given. The treatment advised is extrapleural operation with closure of the tracheal fistula and end-to-end anastomosis of the oesophagus, followed by gastrostomy a day or two later. " Insufflation of the oesophagus with oxygen while the anastomosis is inspected under physiologic saline solution is offered as a useful but not infallible test of the competence of the suture line." *A. G. Riddell*

Hirschsprung's Disease. BODIAN, M., CARTER, C. O., and WARD, B. C. H. (1951). *Lancet*, **1,** 302. 10 figs, 20 refs.

The material for this important study of Hirschsprung's disease consists of 40 consecutive cases treated at the Hospital for Sick Children, Great Ormond Street, London. All cases were confirmed by histological examination of the affected bowel. The authors define the disease by pathological and clinical criteria, give a genetic study of 37 of the families, record the results of the new operative treatment by rectosigmoidectomy in 37 cases, and discuss the pathology and pathogenesis.

True Hirschsprung's disease is a congenital malformation, with inco-ordination of peristalsis in a variable length of terminal bowel, due to absence of the intramural ganglion cells in the affected part and a dysplasia of the associated autonomic nerve-plexuses. This agenesis of nerve-cells results in narrowing of the length of gut affected and produces dilatation of the bowel above. Although this can be confirmed only by microscopical examination of the bowel, the diagnosis can be made radiologically, a barium enema clearly showing the terminal narrow length of large bowel with the dilated bowel above. This radiological picture distinguishes Hirschsprung's disease from the much commoner condition of idiopathic megacolon, where dilatation extends right down to the anus.

The genetic study differs from other published reports in the much larger number of cases, and in the accurate radiological and histological diagnoses. To 37 cases the examination of all the siblings of the families added four more cases, all in boys; this gave a total of 41 cases, of which 38 were in boys and three in girls. It was judged from inquiries, without examination, that there were no cases of the disease among the parents, grandparents, uncles, aunts, and first cousins of the patients. The authors discuss in detail their findings in regard to family incidence and conclude that there is a genetic determination of the disease, with a 1 in 5 chance of affection in a male sibling and a much smaller chance in a female sibling. Similar family investigations by other workers are needed, including an examination of the children of patients successfully treated, before the nature of the genetic factors can be determined.

Treatment by the operation of rectosigmoidectomy [introduced at the Boston Children's Hospital by Swenson and Bill about 3 years ago] was carried out in 37 cases. There were three deaths, two under anaesthesia and one from peritonitis. Of 32 children who have been followed up over periods of 6 months to 2 years, all are in excellent general condition, passing regular motions (about half assisted by laxatives), and all but one have attained an average weight. In three cases there has been anal stricture which has not retarded general progress.

As the morbid anatomy, all but one of these cases were of the " short and intermediate segment " variety, not going above the sigmoid-colon junction; and in an aggregate of ninety histologically verified cases (including the authors' cases), 82 were of this short and intermediate variety, while eight were of the " long segment " variety, where the abnormal bowel extended to the splenic or hepatic flexure and in one case for a short distance up the terminal ileum. In this much less common variety the prognosis is bad, and most of the deaths occur in this group. The morbid histology of all forty cases of the present series showed a complete absence of intramural ganglion cells in the affected segment, with an increase in size of the intramural autonomic nerve fibres.

The authors cautiously discuss the pathogenesis. Their view, " purely theoretical " and based on the morbid anatomy and histology, is that there is a disturbed development of the intramural ganglion cells, which is genetically determined; and that the time of occurrence

of this error of development determines whether the long, intermediate, or short variety develops.

Finally, the paper contains a brief report and discussion of a unique case where the aganglionic bowel extended from the anus to the duodeno-jejunal flexure and where there were no intramural nerve fibres throughout this whole length of large and small bowel. This case, it is suggested, may be "a particularly severe variant of Hirschsprung's disease". *Charles McNeil*

Thirty-six Years' Experience of the Treatment of Pylorospasm in Newborn and Young Infants with Papaverine. (36 Jahre meiner Papaverintherapie der Spasmen des Pylorus bei Neugeborenon und jungen Säuglingen.) MAYERHOFER, E. (1951). *Ann. paediatr., Basel*, **176,** 73. 13 refs.

The author lays stress on having introduced, in 1913, the treatment of pylorospasm with papaverine. Since that time he has treated hundreds of infants with this drug, provided that an early diagnosis had been made. In the presence of a palpable pyloric tumour papaverine has little or no effect, still less in hypertrophic stenosis of the pylorus. The author is of the opinion that the functional spasm resembles the allergic spastic vomiting, both of which may lead to a muscular hypertrophy. To avoid such a development he recommends the combination of papaverine 0·01 g. with amidopyrine 0·05 g. 3 to 4 times daily. In cases of vomiting, suppositories, medicated enemata, or injections of papaverine hydrochloride are indicated. *Franz Heimann*

Pathologic Findings in Premature Infants. AREY, J. B., and DENT, J. (1950). *Amer. J. clin. Path.*, **20,** 1016. 2 figs, 22 refs.

The authors emphasize the importance of prematurity in causing neonatal deaths, of which more than half occur in premature infants. They point out that one should not assume prematurity or atelectasis as such to be the primary cause of death unless all other possibilities have been excluded. Eighty-four premature infants were investigated. They weighed from 500 to 2,500 g. and had a duration of life ranging from 2 minutes to 25 days, 54 having lived less than 24 hours. The authors found that asphyxia was the cause of death in twenty cases, cerebral intraventricular haemorrhage in eleven, congenital syphilis in ten, bronchopneumonia in nine, congenital anomalies in four, and miscellaneous lesions in nineteen. Only in the remaining eleven cases could death be considered as due to no other cause than simple prematurity. [This study was undertaken at a hospital in New Orleans, Louisiana, U.S.A., and 71 of the infants were coloured. This may explain the high percentage of congenital syphilis, and it is also striking, in view of similar studies made in Europe, that only two of the 84 infants had died showing a tentorial tear.]

Of the twenty cases of asphyxia, fifteen showed an intra-pulmonary asphyxial membrane, with well-established aspiration of amniotic debris. In five there was only loose amniotic material in the respiratory tract. Microscopical examination is considered necessary because the macroscopical picture of an asphyxial membrane is indistinguishable from mere atelectasis, bronchopneumonia, and haemorrhage. Some interesting observations are made on the cases of bronchopneumonia, which disease is believed usually to start *in utero*. Whether it is always due to bacteria derived from infected amniotic fluid cannot be determined, and the possibility of simple irritation by amniotic material cannot be excluded. Bacteriological examination was of no value in view of post-mortem invasion. No apparent correlation could be established between premature rupture of the amniotic membrane and bronchopneumonia in infants living less than 24 hours. Premature rupture had taken place in three out of eleven cases of bronchopneumonia, and in eleven out of twenty cases without this disease. In bronchopneumonia, as in asphyxia, histological examination is essential to establish the diagnosis; the infection may be patchy, necessitating an extensive search in all areas of the lungs.

[The authors themselves raise a point which will occur to all readers of their paper who have ever themselves carried out a necropsy in a case of neonatal death. This is the difficulty of deciding which of several findings should be considered the primary cause of death and which factors should be considered merely contributory. Thus in an infant with a small tentorial tear, mild subdural haemorrhage, bronchopneumonia, and a history of premature rupture of the foetal membranes, should bronchopneumonia be considered the primary cause of death, or the intracranial damage ? It is admitted that in many instances only an arbitrary decision can be made.] *H. Lehmann*

Studies on Prematurity. I. Incidence and Obstetrical Considerations. POMERANCE, W., and STEINER, M. (1950). *Amer. J. Obstet. Gynec.*, **60,** 333. 8 refs.

This is the first of four studies made in the Department of Obstetrics and Pediatrics of the Jewish Hospital of Brooklyn. In this investigation all live-born babies weighing less than 2,250 g. were included, there being 962 of these in a total of 20,234 deliveries (4·8 per cent.).

The authors reached the following conclusions: There was no significant variation in incidence of prematurity during the 5-year period studied. There was a greater incidence among ward patients than among private patients, but this difference may be due to the greater number of negroes among the former, negro babies being significantly smaller than white babies. It is pointed out that ward patients have a lower economic status than private patients. [No figures are given for these differences.] There was no seasonal or monthly variation in the incidence of prematurity. There was a greater incidence in primiparous women (61 per cent.). Of the total births 51 per cent. occurred in primiparae and 49 per cent. in multiparae: 17·4 per cent. of premature infants resulted from multiple pregnancies. Complications of pregnancy occurred in 46·5 per cent. of premature births, the commonest being toxaemia (20 per cent.) and antepartum haemorrhage (16 per cent.). Breech presentation occurred in 16·4 per cent. (as against 3·7 per cent. of the 20,234 deliveries); compared with vertex presentation, a higher neonatal mortality occurred only in those infants weighing less than 2,000 g. Premature rupture of the membranes was not associated with any greater neonatal mortality than was late rupture. After induction of labour by rupture of the membranes, delivery by Caesarean section resulted in a lower foetal mortality

than vaginal delivery (40 per cent.); but the neonatal mortality was otherwise, being 17 per cent. after Caesarean section and 7 per cent. after vaginal delivery.

Donald Beaton

Studies on Prematurity. II. Influence of Fetal Maturity on Fatality Rate. STEINER, M., and POMERANCE, W. (1950). *Pediatrics*, **6**, 872. 5 refs.

The fatality rate of 791 liveborn premature infants delivered at the Jewish Hospital of Brooklyn during the 5-year period from 1941 to 1945 was investigated. The data were analysed to determine the significance of fetal maturity and of magnitude of birth weight as factors influencing survival. It was found that for a given weight group the fatality rate varied inversely with the length of the gestation period. In other words, the outlook for the infant improved in proportion to the degree of its maturity. This was especially striking in the case of infants weighing less than 1,500 g., a result which served to emphasize the importance of length of gestation period as well as birth weight in predicting the chance of survival. Premature infants born of multiple births had a lower over-all fatality rate than those born of single births. This was directly attributable to the greater maturity of babies born of multiple births.—[*Authors' summary.*]

The Relation of Birth Weight to Physical Growth. A Statistical Study. ILLINGWORTH, R. S., HARVEY, C. C., and JOWETT, G. H. (1950). *Arch. Dis. Childh.*, **25**, 390. 6 figs, 7 refs.

The authors have extended their previous work (*Lancet*, 1949, **2**, 598) on the relation of birth weight to subsequent weight and height by investigating other standard body dimensions in groups of children of different birth weights. The object was to ascertain whether such measurements would account for the subsequent differences in weight found in children of different birth weights. A total of 238 children between the ages of 5 to 8 years were studied and were divided into three groups according to their birth weights: 5½ lb. (2·5 kg.) or less; 7 lb. 2 oz. to 7 lb. 6 oz. (3·2 to 3·35 kg.); 8½ lb. (3·85 kg.) or more. The standard body dimensions examined were weight, pelvic and calf girth, chest circumference, and standing and sitting height. The methods used to obtain these measurements are described. They found that all the measurements were smaller in those of low birth weight than in those of high birth weight and that the measurements of children of average birth weight fell between the two. These findings were found to be statistically significant (there is an appendix to the paper in which the statistical methods used are described). Emphasis is placed on the importance and possible long-term effects of controllable factors that influence birth weight, such as premature induction of labour and the prevention of prematurity by the improvement of the nutritional and social circumstances of the mother.

David Morris

A Comparison of Elder and Younger Primiparae. ARNOT, P. H., and NELSON, D. R. (1950). *West. J. Surg. Obstet. Gynec.*, **58**, 535. 9 refs.

Out of a total of 9,600 parturient women, 346 (3·6 per cent.) were primiparae over 35 years and classed as " elder ", 41 were over 40 years, the two oldest being 45 and 46; the majority were 35 and 36 years. A similar number were primiparae between 18 and 29 years and were classed as "younger": 23 were under 18 years of age. All cases were from the authors' clinic at San Francisco, California, and the methods and technique were much the same in each group. The study extends over 27 years and any important change in treatment as time passed was adopted by the authors' associates, so that comparisons between the different groups are not affected.

For the purpose of comparison the following are among the diagnoses selected: placenta praevia, premature separation of the placenta, toxaemia, hypertension, cardiac disease, pyelitis, post-partum haemorrhage, contracted pelvis, occipito-posterior and breech presentations. The authors also discuss the types of delivery required, the incidence of forceps, day of delivery in relation to expected date of confinement, induction, and duration of labour in each group.

Those interested in the detailed statistics should, of course, refer to the original article, but the following facts may be of interest: (1) The incidence of elderly primiparae was 3·6 per cent. (2) The incidence of toxaemia was 6·8 per cent. in the elderly, and 2·3 per cent. and 4·3 per cent. respectively in the two younger groups. (3) Placenta praevia, premature separation of the placenta, pyelitis, and myomata uteri occurred only in the elder group. These conditions did not occur in patients under 29 years old. (4) Post-partum haemorrhage, cardiac disease, and syphilis were more common among the elderly. (5) Third-degree lacerations were more frequent in the two younger groups, particularly in primiparae under 18 years of age. (6) Posterior vertex presentations were more common in the elderly, and operative procedures were required more often for these conditions in the elderly than in the younger groups. (7) Forceps and Caesarean-section deliveries were increased in the elderly, but vaginal breech deliveries were about the same in all three groups. Caesarean section was more often needed for breech cases in the elderly. (8) Prolonged labour, both 24 to 30 and also over 30 hours, was a little more common in the older women. But the average length of prolonged labour was 32·32 hours in the elderly group as compared with 42·4 hours in the younger. (9) Incidence of contracted pelvis was 3·06 per cent. in the elderly, 1·44 per cent. in the younger, and 8·7 per cent. in primiparae under 18 years. (10) Average weight of babies was about the same in all groups. (11) Maternal and foetal mortality were increased in the elderly group.

The authors conclude that there is more risk for the elderly primipara, chiefly because she is more apt to acquire those diseases which occur more frequently as age increases.

E. W. Kirk

Postpartum Blood Loss. An Analysis of 6,000 Cases. VANT, J. R. (1950). *Amer. J. Obstet. Gynec.*, **60**, 483. 7 refs.

An analysis of more than 6,000 cases delivered at the University of Alberta Hospital shows a substantial reduction in the average estimated blood loss during and after delivery after much closer attention had been given to certain points of detail in the preparation for and management of labour. In a series of 2,000 cases

reported in 1948, there was a loss of more than 600 ml. blood in 15·7 per cent., and amounting to more than 1 per cent. of body weight in 10 per cent., with an average loss of 323 ml. in the third stage. In the present series of 4,204 patients delivered since then, blood loss averaged only 219 ml., and only exceeded 600 ml. in 4·3 per cent. and 1 per cent. of body weight in 3 per cent. Episiotomy or laceration of the perineum resulted in an average increase of 189 ml. in blood loss in the first series, and of 110 ml. in the second. Similarly, the effect of the duration of the third stage on the amount lost was diminished, the average loss in the first series being 292 ml. where the duration was under 6 minutes, increasing to an average of 529 ml. where the duration was greater than 60 minutes, whereas in the present series the average loss amounted to 214 ml. where the duration was under six minutes, increasing only to 314 ml. where the duration was greater than one hour.

This substantial reduction of blood loss in the third stage is attributed to the following factors: (1) Supervision of the patient's weight so as to maintain it at an optimum level, heavier patients having an increased tendency to blood loss. (2) The treatment of anaemia and diminished specific gravity of the serum during pregnancy with judicious iron therapy. (3) Better estimation of the pelvic capacity and earlier detection of soft-tissue dystocia, thereby avoiding unnecessary lacerations. (4) More active interference in the third stage by giving intravenous ergometrine as soon as the anterior shoulder is born, with expression of the placenta following the birth of the baby. If the placenta is slow in separating and bleeding occurs, manual removal should be proceeded with in the shortest possible time. (5) Keeping sedation within reasonable limits and avoidance of complete unconsciousness in labour, together with conditioning of the patient to the physical strain of labour and combating the fear-pain-tension syndrome on the lines laid down by Read. Relief of pain is thus attained through strengthening the psychological powers of control of the patient rather than with heavy doses of narcotics. With the adoption of these methods mental and physical post-partum apathy has greatly diminished and, as the records of cases show, this has been attended by a marked decrease in blood loss in the immediate post-partum period. *A. Wallach*

Spasmolytic Drugs in the Treatment of Premature Rupture of the Membranes. A Report on 2,782 Cases. (Spasmolytica in der Therapie des vorzeitigen Blasensprungs. Ein Erfahrungbericht an 2,782 Fallen.) GROSS, R., and SCHILDBACH, H. (1950). *Arch. Gynäk.*, **177,** 705. 13 figs, 32 refs.

The authors are of the opinion that in cases of premature rupture of the membranes spasm of the soft parts develops during labour more frequently than in those with intact membranes. They consider that at the moment of premature rupture of the membranes the uterus is not yet ready to begin expulsion of its contents and that therefore attempts to induce labour by use of oxytocic drugs or other means are incorrect and may bring about complications. On the contrary, an attempt should be made to reduce resistance of soft parts with the help of spasmolytic drugs. This is the policy of the Landesfrauenklinik in Wuppertal, at which the authors investigated 2,782 cases of premature rupture of the membranes, seen during 1937 to 1946, and treated with spasmolytic drugs. The drugs used were at first " eupaco " suppositories, and later " spasmalgin " injections. The doses are not given in detail, but the average doses are given in two diagrams.

The results obtained were encouraging. The figures for instrumental delivery and Caesarean section were halved in primiparae and diminished in multiparae; asphyxia was less common and the figure for foetal mortality was improved. Complications during the third stage, injuries to the cervix, and incision of the external os were less common. Pyrexia during labour was somewhat commoner owing to the prolonged duration of labour, but the incidence of puerperal pyrexia due to genital injuries was diminished by half.

Martin Scholtz

Did Eclampsia become Less Common during the Second World War ? (Ist die Eklampsie auch im letzten Krieg (1939-1945) zurückgegangen ?) BURGER, H. (1950). *Zbl. Gynäk.*, **72,** 551. 17 refs.

During the year 1946 the incidence of cases of eclampsia admitted to the County Hospital, Göppingen, was high, amounting to eight out of 619 normal births, corresponding to a frequency of 1 in 77. On the other hand, only five cases of eclampsia were observed in 1,238 births in the University Clinic, Tübingen. Regional differences between Göppingen and Tübingen (both in Württemberg) do not exist, and the difference must be ascribed to other circumstances. Analysis of case histories showed that patients in Göppingen had had much more to eat. All patients coming from this region could get all the fat and protein they wanted. The author thinks that this factor was associated with the increase in incidence of eclampsia in Göppingen.

Albert Eichner

Further Observations on the Age of the Menarche. WILSON, D. C., and SUTHERLAND, I. (1950). *Brit. med. J.*, **2,** 862. 1 fig., 2 refs.

The age of the menarche calculated by Probit analysis in 3,000 school-children in England averaged 13·5 years. Weight and height differences appeared to have no causal relation to onset of menstruation. Growth in the adolescent girl is affected by maturation more particularly in body build rather than in height.

D. B. Fraser

Time of Ovulation. A Correlation between Basal Temperature, the Appearance of the Endometrium, and the Appearance of the Ovary. BUXTON, C. L., and ENGLE, E. T. (1950). *Amer. J. Obstet. Gynec.*, **60,** 539. 5 figs, 12 refs.

In order to assess the value of a rise in the basal body temperature in indicating accurately the time of ovulation, the authors studied its relation to changes in the appearance of the endometrium and of the ovaries in eighteen patients at the Sloane Hospital for Women, New York, who were awaiting laparotomy and who showed the characteristic mid-cycle rise of basal temperature. The patients were admitted to hospital several days before the expected temperature rise, and laparotomy was performed on the day this occurred. (The temperature

was taken only once daily, so that an error of up to 24 hours was to be expected.) At operation an endometrial biopsy was obtained and the ovaries were examined, any corpus luteum present being excised and examined microscopically.

The authors consider that the interpretation of the age of the corpus luteum in days is not an easy procedure, but they accepted as normal the disappearance of cell mitosis at 12 hours, the ingrowth of fibroblastic cells at 24 hours, the invasion of the new luteum layer by capillaries in 36 hours, and complete vascularization by the end of 48 hours. On this basis, in six of the eighteen patients there was no definite evidence of ovulation having occurred; in two cases the appearances fell into the 12-hour group, in four into the 24-hour group, in two into the 36-hour group, and in the other four they were equally divided between the 48- and 72-hour groups. The changes in the endometrium, on the other hand, were much less advanced, no evidence of luteal activity being found until the corpora lutea were at least 36 hours old.

From these findings it appears that there can be a difference of up to 4 days between the time of the basal temperature rise and the time of ovulation, and the authors therefore consider it not to be a suitable method for clinical use unless its limitations are fully appreciated.

Elaine M. Sunderland

Anovulatory Menstruation in Women. WONG, A. S. H., ENGLE, E. T., and BUXTON, C. L. (1950). *Amer. J. Obstet. Gynec.*, **60**, 790. 4 figs, 23 refs.

There is good evidence that cyclic bleeding of the anovulatory type can occur, and that it is indistinguishable from ovulatory menstruation in duration, amount, and nature. Hartman found that in apparently healthy rhesus monkeys, which menstruate regularly throughout the year, menstruation without the formation of a corpus luteum was the rule in the summer months, while ovulatory cycles were prevalent in winter. Similar anovulatory cycles were common at puberty, in the post-partum period, during lactation, and after strenuous journeys or physical illness. For determining ovulation in women neither estimation of gonadotrophin or of pregnanediol excretion nor the local body temperature chart is reliable. The most reliable method at present is endometrial biopsy.

This was the method followed in the present investigation, which concerns 36 women whose complaint was involuntary sterility. Great care was taken to get reliable results. Thus cases of irregular or sporadic bleeding were excluded; the previous menstrual period must have preceded the biopsy by at least 21 days, and the biopsy must have been taken within 2 days of the next flow. Adolescent girls were excluded, as were women whose menstrual period had started more than 12 hours before the biopsy. Only thirteen of the women reported normal menstruation; ten had oligomenorrhoea, seven had oligomenorrhoea followed by episodes of temporary secondary amenorrhoea, and five had a history of normal cycles interspersed with short periods of secondary amenorrhoea. Such menstrual irregularity in sterile patients is evidence of hormonal imbalance, and, especially if there is also obesity and hirsutism, should lead one to suspect the possibility of anovulation.

Among the 36 women there were 47 instances of anovulatory cycles, the number of anovulatory cycles varying from 1 to 5. Nineteen of the 36 were anovulatory for the entire duration of the investigation and follow-up, while the remaining seventeen were periodically so. Of these seventeen women four became pregnant. The authors suspect that the true incidence of anovulatory cycles is much higher than is usually believed.

F. J. Browne

Amenorrhoea in Concentration Camps. (L'amenorrea nelle internate in campo di concentramento.) GYARMATI, E. (1950). *Minerva ginec.*, **2**, 381. 1 fig., bibl.

After a survey of the literature on the " amenorrhoea of war ", the author records his own studies carried out in a Russian concentration camp from 1946 to 1950. Among 1,300 women he found 606 suffering from amenorrhoea, that is 46 per cent.

In the aetiology of the condition the first place is given to psychic trauma and then to individual predisposition. Alimentary conditions and stress are only contributory factors. Frequency, duration, and symptomatology are then discussed in detail, especially in respect of the age of the women.

Emotional factors give rise, it is suggested, to neurovegetative disorders arising from the diencephalon and affecting the secretion of the pituitary in such a way as to cause the arrest of ovarian activity and consequently amenorrhoea.

R. d'Amico

Statistical Study of 6,000 Cases of Diabetes. JOHN, H. J. (1950). *Ann. intern. Med.*, **33**, 925. 7 figs, 4 refs.

Detection of Diabetes in a Nutrition Survey—A Study of 550 Persons in Ottawa County, Michigan. TABOR, E. C., and FRANKHAUSER, K. H. (1950). *Publ. Hlth Rep., Wash.*, **65**, 1330. 9 refs.

Uniovular Twins showing Growth Disparity due to Renal Dwarfism. MILNE, M. D. (1951). *Lancet*, **1**, 204. 3 figs, 19 refs.

Occupational Factors in the Aetiology of Gastric and Duodenal Ulcers with an Estimate of their Incidence in the General Population. DOLL, R., and JONES, F. A. (1951). *Spec. Rep. Ser. med. Res. Coun., Lond.*, No. 276. 3 figs, bibl.